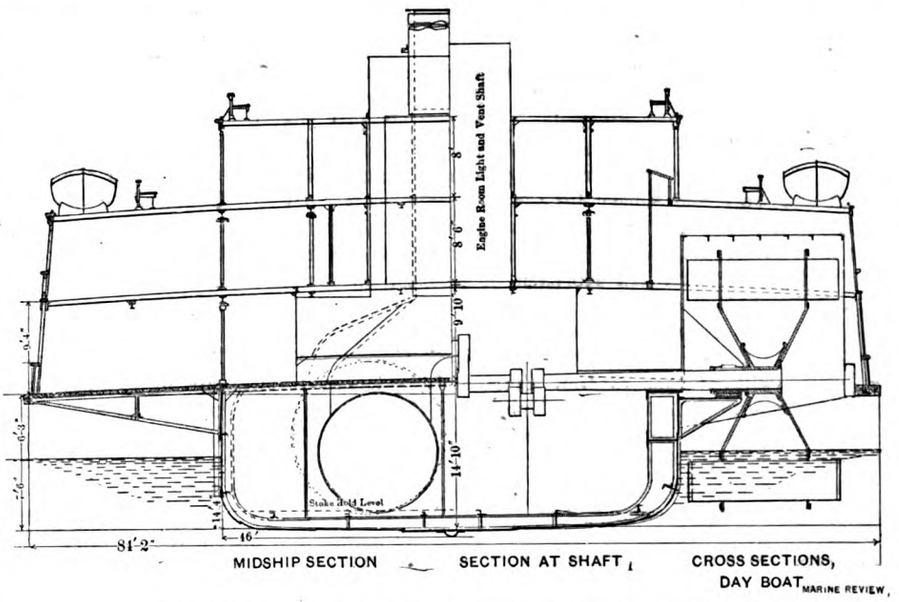
THE MARINE REVIEW

VOL. XXXIII. CLEVELAND, APRIL 5, 1906. No. 14.

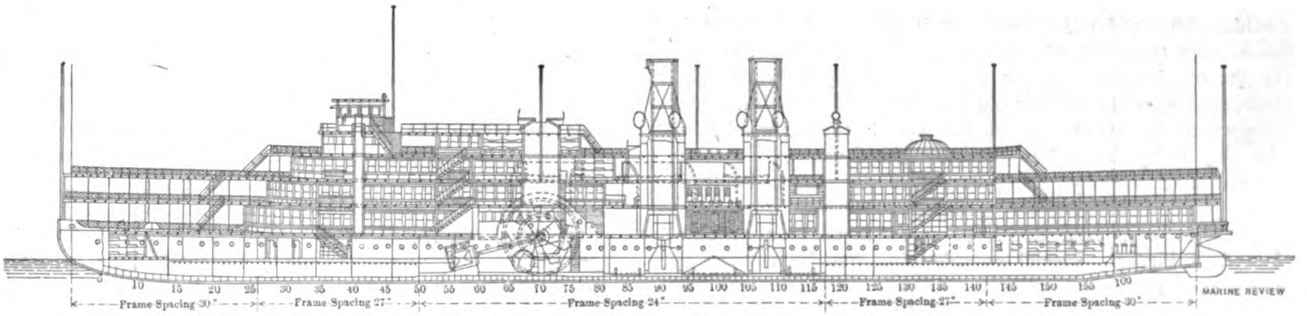
LAUNCH OF THE HENDRICK HUDSON.

The steel steamer Hendrick Hudson, building for the Hudson River Day line at the ship yard of Thomas S. Marvel, Newburg, N. Y., was launched on Saturday afternoon last in the presence of thousands. The vessel was christened by Miss Katherine Olcott, the twelve-year-old daughter of Elmer E. Olcott, president of the Hudson River Day line. Instead of the customary bottle of champagne, however, she broke a bottle containing water over the bow of the vessel as she was released from the ways and at the same time liberated a number of doves, according to the Japanese custom. The sister steamer, New York, carried a party of about 500 guests from New York to Newburg to witness the launch. The most notable of these guests was Mr. Charles H. Haswell, the dean of American marine engineers, who is now approaching his ninety-eighth year, and who personally remembers the Clermont, the first steamboat ever constructed. The launching was really a gala occasion, as the river was covered with steamboats, launches and tugs, all of them gaily decorated.

The Hendrick Hudson, which was designed by Mr. Frank E. Kirby, of Detroit, is the largest river steamboat in the world. She is 400 ft. long, 82 ft. beam and 14 ft. deep. In a way she is the best thing that Frank Kirby has ever done. She is the embodiment of everything that is best in steamers of her type, and Mr. Kirby was given a free hand in making her the finest steamer for day service that has yet been built. She is exclusively designed for first-class passenger trade and is not intended to carry a pound of freight. She has four decks, namely, main deck, saloon deck, hurricane deck and shade deck. Below the main deck are large rooms forward and galley aft. The lunch room is finished in what is known as the cabin style of decoration. The main deck is finished in oak in a French gray tone for the music room and as far aft as the diningroom, which is to be finished in mahogany. The entire saloon deck will be in mahogany. A new feature of the boat is large observation rooms on the hurricane deck finished in cypress in a dull gray stain. It is the purpose of the company to devote the large after-observation rooms for holding con-

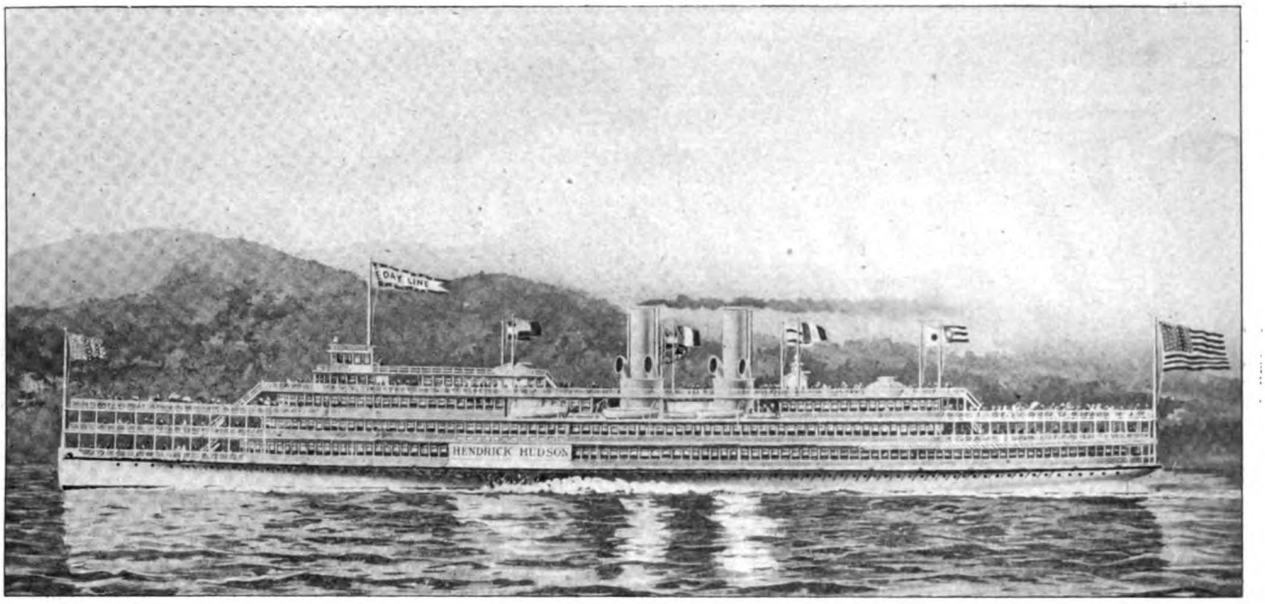


MIDSHIP SECTION OF THE STEAMER HENDRICK HUDSON.



LONGITUDINAL SECTION OF THE STEAMER HENDRICK HUDSON.

Generated on 2024-08-30 17:59 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



THE STEAMER HENDRICK HUDSON AS SHE WILL APPEAR WHEN COMPLETED.

ventions. The steamer will have accommodations for 5,000 passengers. A physician will be carried on each trip. There will also be stenographic rooms, photographic dark room and all conveniences both for the business man and the tourist.

The familiar walking beam will be absent in the new vessel. Her engines are to be of the inclined three-cylinder short-stroke type. The steamship company feels that the Hendrick Hudson is the climax in a long period of evolution as this company has done the passenger business between New York and Albany for the past sixty years. Associated with Mr. Kirby in the construction of this vessel have been Mr. J. W. Millard, naval architect, of New York; Mr. Andrew Fletcher, Jr., Hoboken, mechanical engineer; and Mr. Lewis Keil of Detroit, specialist in ship joiner work designing. The engines for the steamer are being built by the W. & A. Fletcher Co., Hoboken, N. J., the joiner work by John English & Son, of New York, and the boilers by the New York Ship Building Co., Camden, N. J.

There is no doubt that Mr. Kirby has produced for the Hudson River Day Line a splendid type of steamer. She is fast and safe, her structure being as rigid as a steel building and absolutely indestructible by fire.

FOUR FREIGHTERS UNDER CONSTRUCTION.

The Fore River Ship Building Co., Quincy, Mass., is building four steamers, duplicates, to be known as Satilla, Ocmulgee, Ogeechee and Ossabaw for the Atlantic & Birmingham Construction Co., Empire bldg., Atlanta, Ga. These vessels are being constructed of mild steel from designs prepared by the ship building company, and are of the following dimensions: Length over all, 313 ft.; breadth, molded, 40 ft.; depth of hold, 25 ft. 6 in.; displacement in tons, 5,000 tons. These vessels have been designed to carry the maximum of freight on an unusually light draught, and consequently are arranged with the propelling machinery at the after end of the vessel, the remainder of the ship being devoted to the stowage of cargo. To minimize broken stowage the pillaring of the cargo holds is being carried out on the girder system with two large columns in each hold connected at the head to a continuous deck girder. Special consideration has been given to the strength of these vessels, which is in excess of that usually provided in ordinary freighter construction.

These vessels have a straight stem and semi-elliptical stern, and have the general appearance shown in the illustration. There are three large cargo holds having four hatchways suitably arranged for the expeditious handling of freight. In addition to these hatchways the cargo can be manipulated through four cargo ports on each side of the vessel which are about 10 ft. by 7 ft. in the clear, and arranged with sliding trolley doors. These cargo holds are isolated from each other by steel watertight bulkheads, which with the collision, machinery space and stern tube bulkheads divide the vessel into seven separate watertight compartments which will insure the vessel floating with any two of the compartments flooded by the sea, and in addition to this will insure greater isolation in the event of fire, to one compartment.

The vessel has been rigged with two steel pole masts having four derricks fitted to each with a working capacity of 7½ tons per derrick. These derricks are stepped on strong steel tables and are suitably rigged for working the cargo by means of powerful winches, in the most expeditious manner possible. These winches are of the most up-to-date type and are arranged in pairs at the forward and after sides of masts, making eight winches in all.

To insure that the vessel will trim properly when steaming light, owing to having the machinery arranged at the extreme after end, deep trimming tanks have been arranged right forward and in the fore hold a water ballast tank has been arranged for. The officers' quarters are located in a steel superstructure built around the engine and boiler casings, providing especially well lighted and ventilated staterooms for the officers and engineers, with a handsome dining saloon amidships at the forward end of the superstructure. The crew, firemen, oilers and water tenders will be berthed on main deck in way of machinery space. The superstructure is decked over forming a bridge deck, on which the life boats are stowed, and with pilot house and captain's room at the forward end. The captain's suite comprises bed room and sitting room, with stairs leading therefrom to the dining saloon on upper deck.

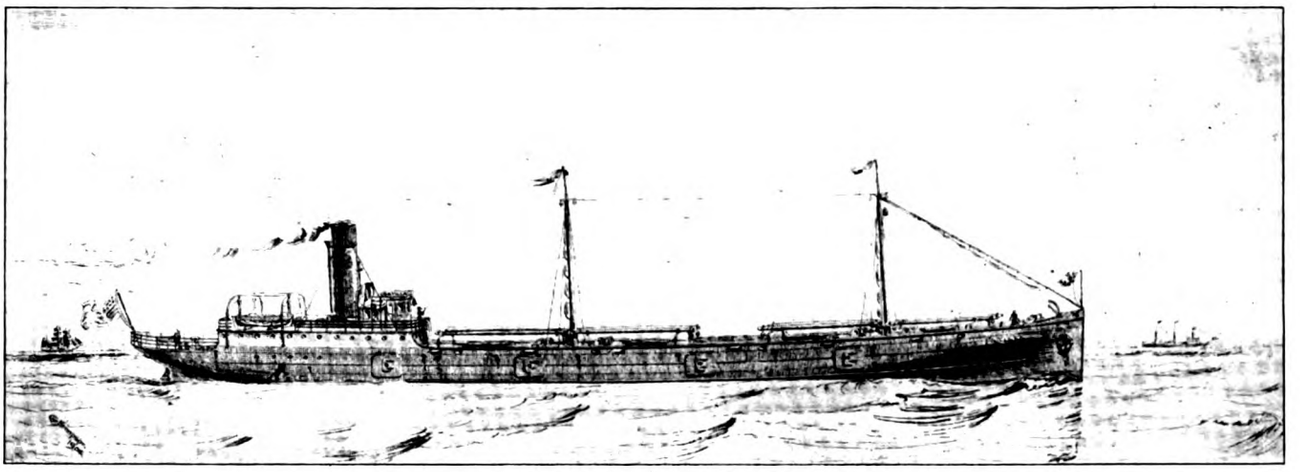
The usual pumping and drainage, sanitary and firemain systems have been arranged for on the most approved lines and in addition an electric light installation of ample power will be fitted. Steam steering and screw hand gear will be

Generated on 2024-08-30 17:57 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

installed with steering stations in pilot house and on quarter deck aft. On this deck will also be fitted a powerful steam warping capstan. The anchor handling arrangement consists of a steam windlass of the most approved make, with the operating engines placed on main deck forward under cover.

The propelling machinery consists of one set of triple expansion, surface condensing engines supplied with steam by two single ended Scotch boilers, suitable for developing sufficient power to propell the vessels at a continuous sea speed of 10½ knots per hour.

Altogether these vessels are a considerable advance on the ordinary freighter having been designed not only to carry an exceptionally large cargo on light draught, but with the necessary appliances arranged for loading and discharging same in the minimum space of time.



LIGHT DRAUGHT BOAT FOR RIVER SERVICE.

LIGHT DRAUGHT BOAT FOR RIVER SERVICE.

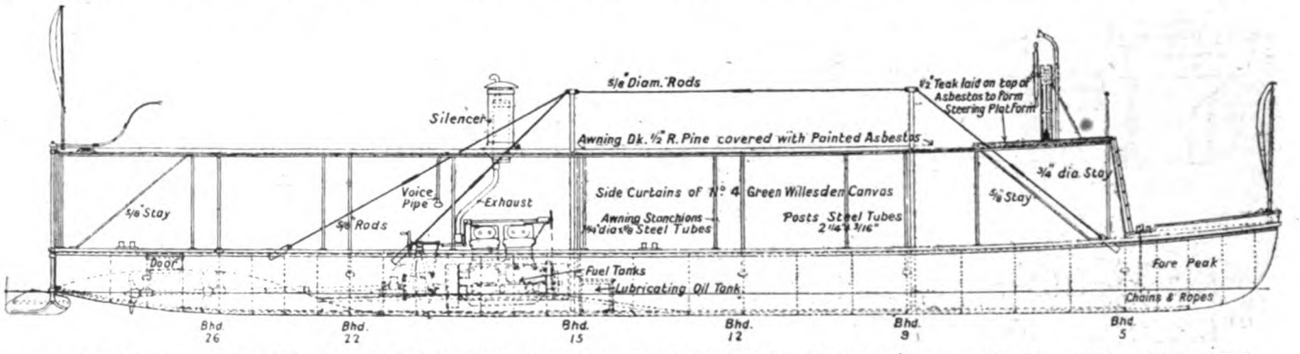
Messrs. J. J. Thornycroft & Co., Chiswick, have built two light draught boats, driven by internal combustion motors for the crown agents of the colonies under the superintendence of Sir Edward Reed. One is driven by a screw and the other by a stern wheel.

The Spider, which is the name of the screw-boat, is built of galvanized steel, and is 56 ft. 3 in. over all, and 9 ft. beam, with a draught of 12 in. when carrying a load of 4 tons. The hull is open, with a short deck over the fore peak, and protected from the tropical sun by a light wood awning, on which is placed the steering-wheel forward. There are curtains along the sides, of green Willesden canvas. The hull is subdivided by six water-tight bulkheads, floor boards being fitted along the bottom of the boat. To facilitate steering on the light draught, three single-plate balanced rudders are provided. There are two propellers on one shaft working in a tunnel, an arrangement found to be the most suitable in this class of vessel.

The engine is a four-cylinder Thornycroft marine motor, the cylinders being 6 in. in diameter and 8 in. stroke. The normal number of revolutions is 800, and at this speed the engine develops 40 brake horsepower on paraffin; as, however, the engine is intended to run at a very low number of revolutions—approximately 380—it will not develop more than 25 horsepower. The capacity of the fuel tanks is 80 gallons. The motor can be worked with either petrol or paraffin, a carburettor and a vaporizer both being fitted.

The Spider on trial, when using petrol, attained a mean speed of 8 knots, with a load of 4 tons and a draught of 12 in. This was 2 miles over the contract speed, and was considered a highly satisfactory performance for a boat of this shape, having a form of hull necessary to carry the weight on the light draught; with paraffin the speed would be about 1 knot less. The boat will be shipped out complete, the machinery and fittings being previously taken out and packed in cases.

The twin-screw steel steamer Callahan, built by the Harlan & Hollingsworth Corporation for the Norfolk & Washington Co., Washington, D. C., was launched last week. The Callahan is 190 ft. over all, 39 ft. beam and 16½ ft deep. She will have one four-cylinder triple-expansion engine and Scotch boilers.



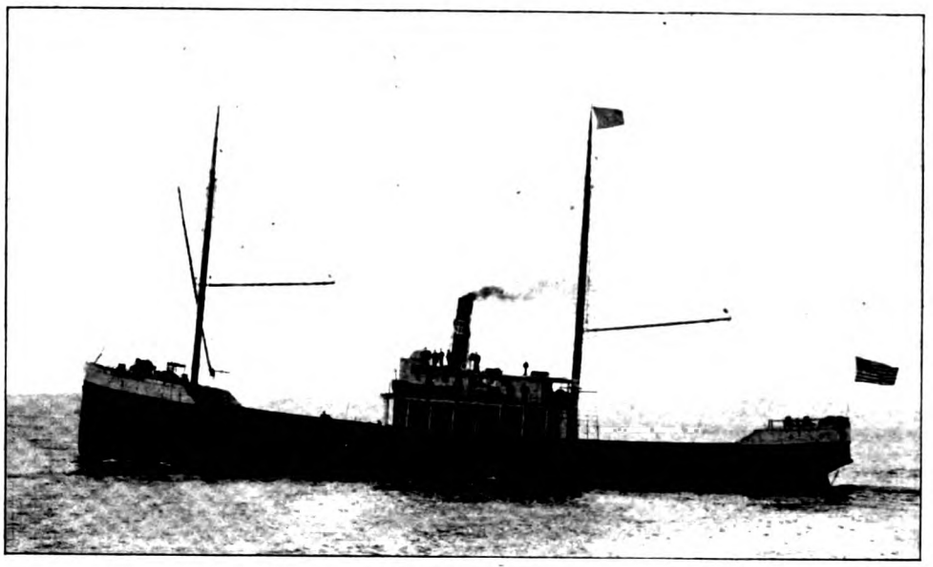
SKETCH OF THE STEAMERS BUILDING FOR THE ATLANTIC & BIRMINGHAM CONSTRUCTION CO. BY THE FORE RIVER SHIP BUILDING CO.

When the package freight steamer Wyoming comes out this season she will be the largest lumber steamer on the lakes. She is now being cut down into a lumber boat at Abram Smith's yard at Algonac.

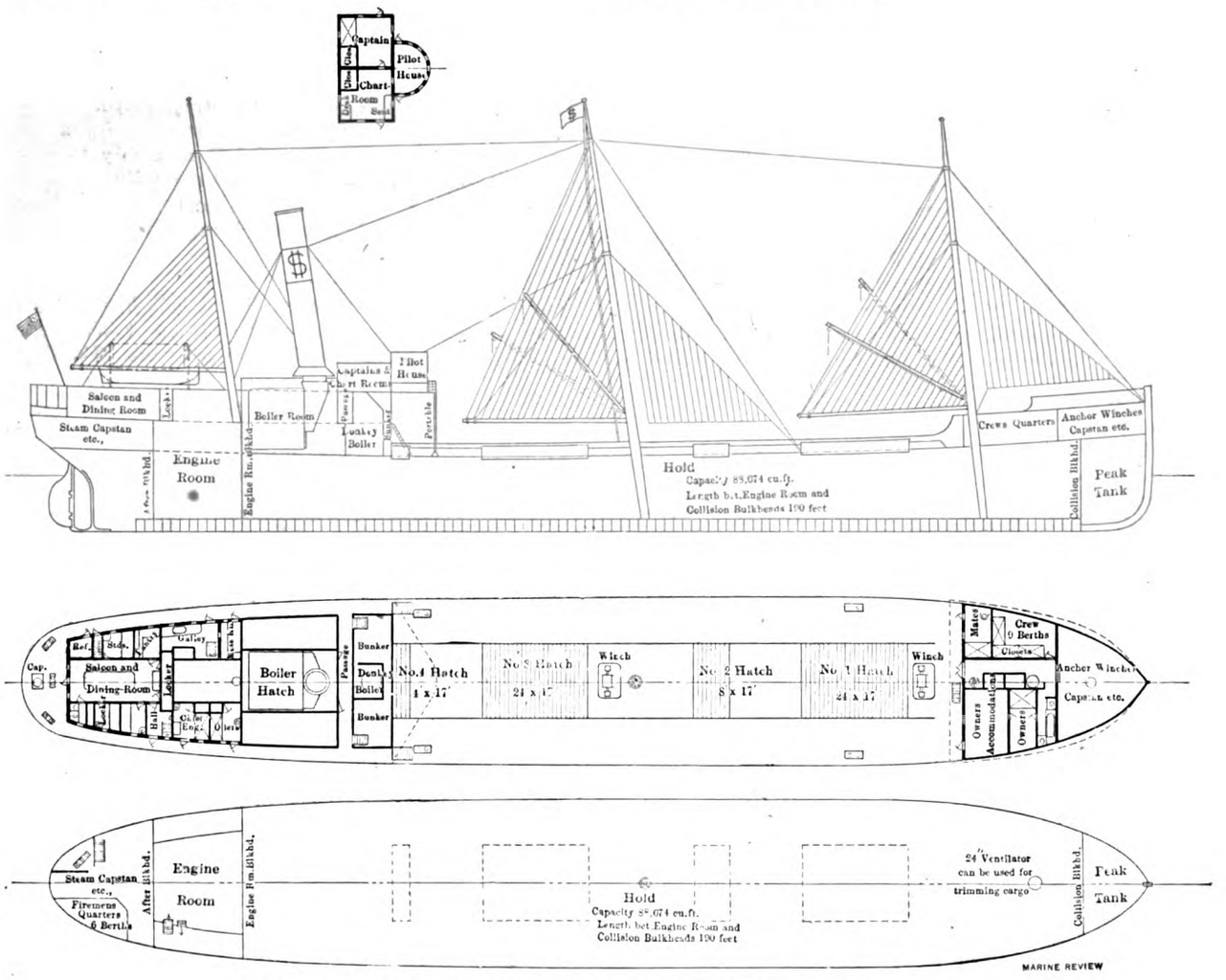
Generated on 2024-08-30 17:56 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

STEAM SCHOONERS.

The typical freight coasting vessel on the coast is the steam schooner, a designation which to eastern men seems a contradiction in terms. Illustrations are given herewith of two of these vessels, inboard profile and deck plans of the Melville Dollar and deck plan and outboard profile of the Robert Dollar. The photographs show exactly what these so-called schooners look like. They were designed primarily for the lumber trade and are so constructed as to carry very heavy deck loads of lumber. The Melville Dollar was built of steel at West Bay City, Mich., by F. W. Wheeler & Co. She was intended originally for carrying lumber on the lakes, but was purchased by the Dollar Steamship Co. of San Francisco, who fitted her out on the Atlantic coast for a trip around the horn. The Melville is 239 ft. keel, 38 ft. beam and 14 ft. deep. Her gross tonnage is 1,380 and net tonnage 1,103. Her engines are triple-expansion with cylinders 16, 25 and 42-in. diameter by 33-in. stroke, allowed 170 lbs. pressure. The boiler is 13 ft. 6 in. diameter and 11 ft. long, the heating surface being 1,650 sq. ft. and a grate area of 60 sq. ft. She consumes 12 tons of Pocahontas coal in twenty-four hours. She is also equipped with a donkey boiler 4 ft. 7 in. diameter and 9 ft. 2 in. long. The Melville Dollar



STEAM SCHOONER ROBERT DOLLAR.

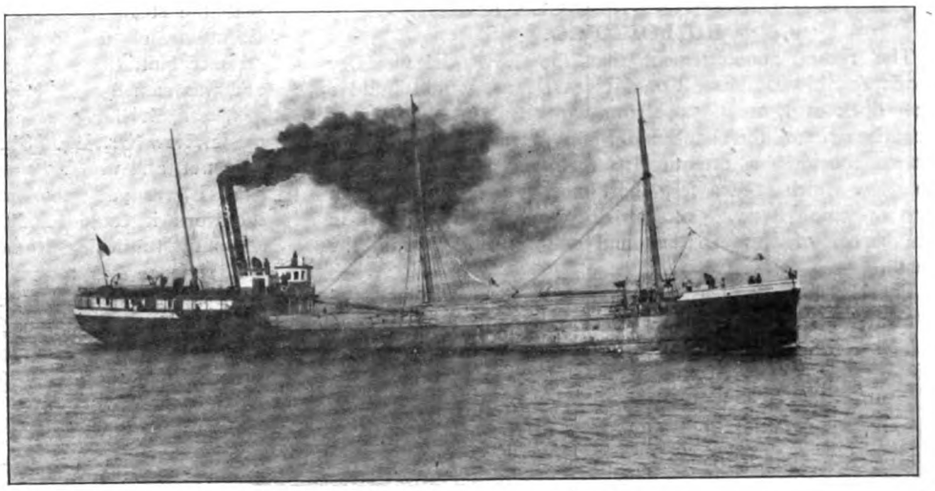


PROFILE AND DECK PLANS OF STEAM SCHOONER MELVILLE DOLLAR.

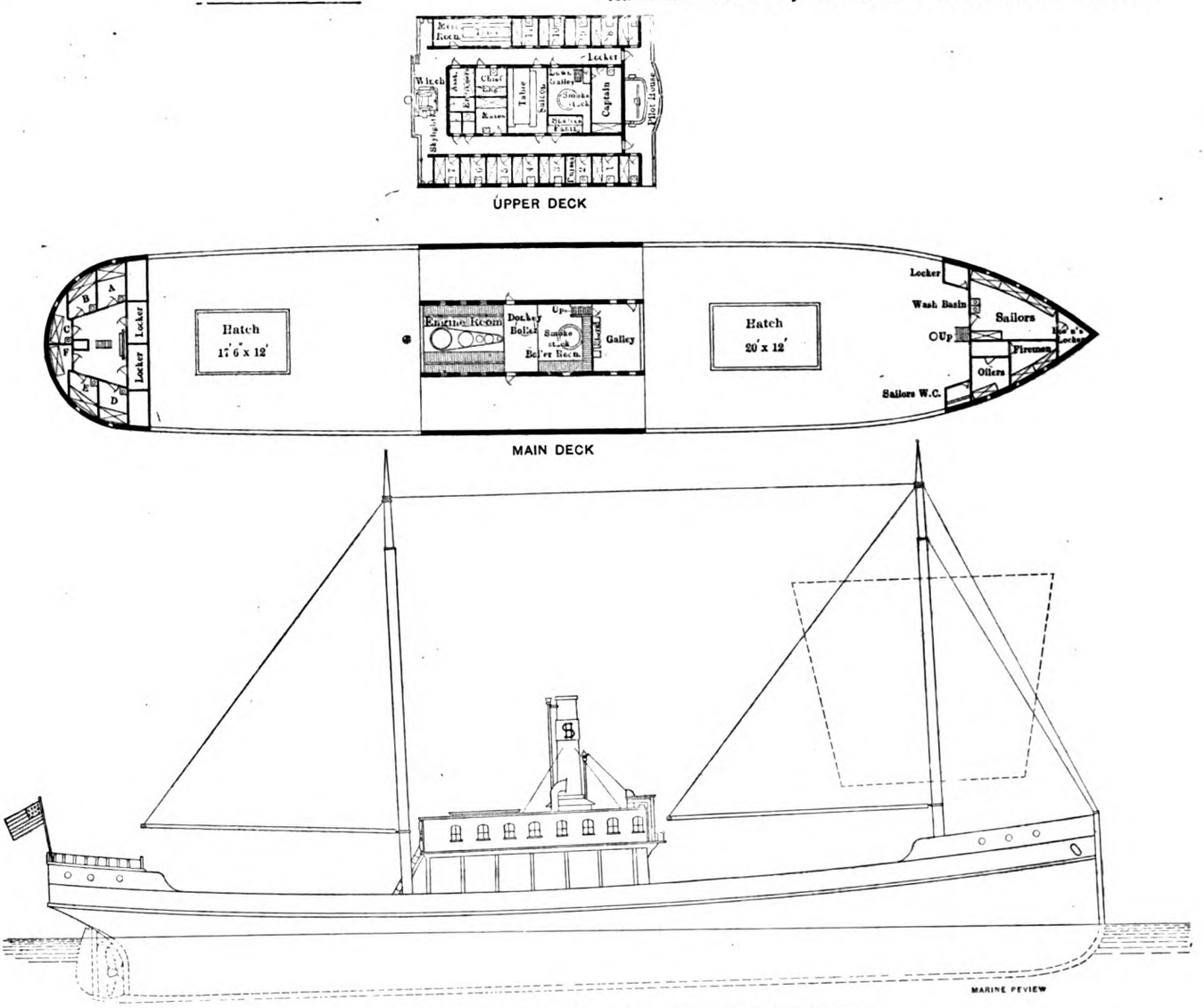
Generated on 2024-08-30 17:59 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

is capable of carrying a total cargo of 1,250,000 ft. of lumber.

The steamer Robert Dollar was built by George H. Hitchings of Hoquiam, Wash. Her hull is of wood and she is 270 ft. long over all, 199 ft. keel, 38 ft. beam and 13 ft. deep. Her tonnage is 798 gross tons and 533 net tons. Her engines are triple-expansion, 13, 20½ and 36-in. cylinder diameters by 24 in. stroke, supplied with steam from two Babcock & Wilcox water-tube boilers; heating surface 440 sq. ft. and grate surface 62 sq. ft., allowed 225 lbs. pressure. In addition to carrying 900 tons of coal and 350,000 ft. of lumber, she has cabin capacity for forty-seven passengers.



STEAM SCHOONER MELVILLE DOLLAR.



PROFILE AND DECK PLAN OF STEAM SCHOONER ROBERT DOLLAR.

As a sequel to the great storm last November on Lake Superior, A. Booth & Co., of Chicago, have filed suit in the United States district court at Duluth against the barge Constitution. They ask for $10,000 which they claim was earned by the steamer C. W. Moore in rescuing the Constitution while it was lying in a helpless condition.

Generated on 2024-08-30 17:56 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

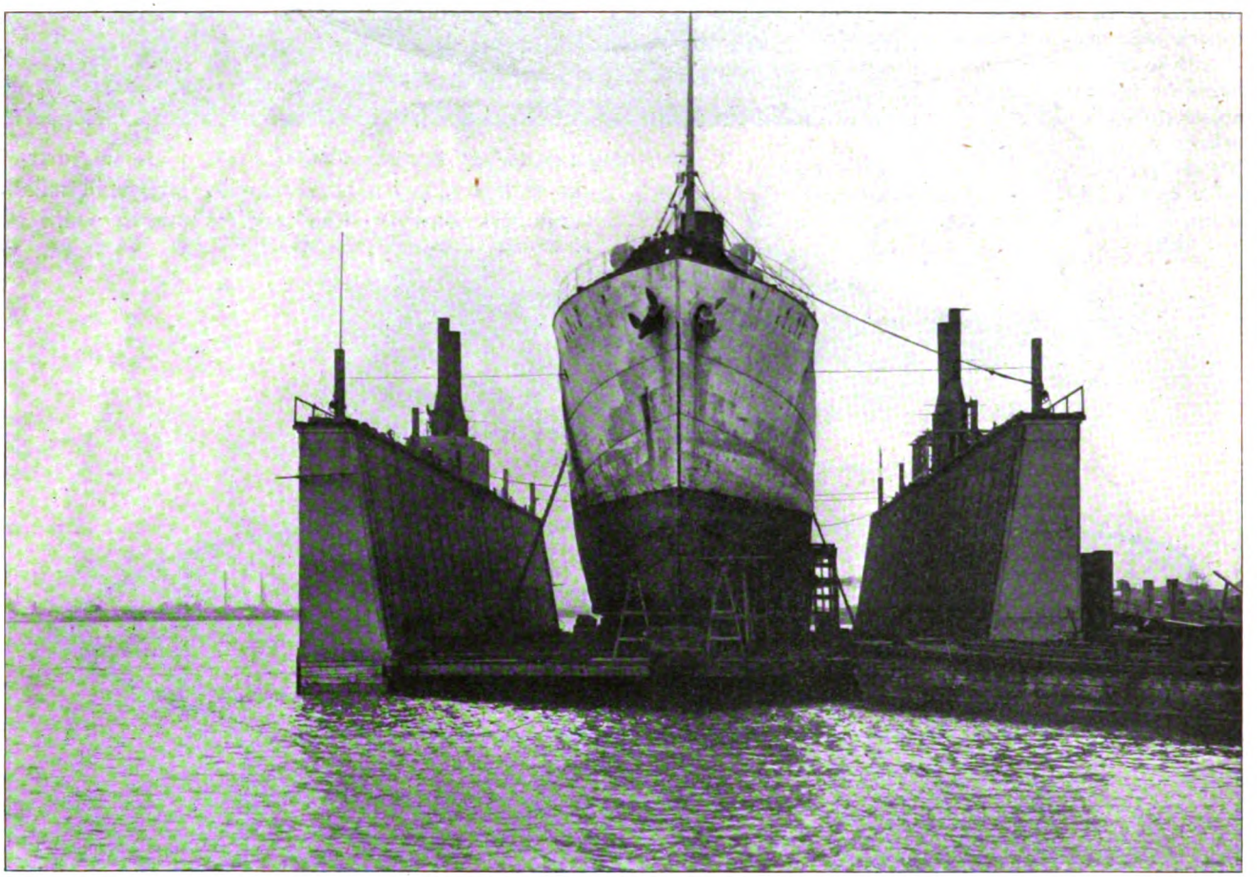
NEW ORLEANS DRY DOCK & SHIP BUILDING CO.

The recent announcement that the New Orleans Dry Dock & Ship Building Co., New Orleans, would build a new dock of 1,500 to 5,000 tons capacity, and that it was negotiating for the lumber for this structure, has again drawn considerable attention to the operations of this big company which only a few short months ago built and put into operation a new 5,000-ton dock, one of the largest in the harbor of New Orleans and one of the finest in the south.

The big dock has been in commission for some time and has lifted many big vessels. It is capable of lifting 5,000 tons dead weight and can take in ships 375 ft. in length. The big structure is a solid box dock, 242 ft. long in the box, with out-riggers at each end 45 ft. in length. The total length along the keel blocks is 332 ft. over all. The box is 95 ft. wide and 14 ft. deep in the hold, and the depth of the wings is 40 ft. This permits a draught of water of 22 ft. over the tops of the keel blocks. There are eight divisions athwartships in the box and two divisions fore and aft. The bulkheads are absolutely watertight, and as a result the dock is easily controlled. Each one of the athwartship compartments is equipped with four 14-in. square box pumps, with a stroke of 20 in., 14 in. in diameter, and operated at a speed of forty strokes per minute by two vertical engines arranged on each side of the wings. The engines are geared to the main line shaft and steam for them is furnished by two 70-H. P. vertical boilers, with a steam pressure of 125 lbs. Fuel oil, instead of coal, is used. This is kept in iron tanks placed in the wings. The oil-pumping apparatus is of the latest improved pattern and was supplied by Messrs. A. M. Lockett and Co., Ltd., of New Orleans.

In the accompanying illustration the new dock is shown with the steamship Ellis, a new vessel of the United Fruit Co.'s line, on the blocks. The Ellis is a fine steel screw steamer built especially for the fruit trade of New Orleans and was named after Crawford H. Ellis, the manager of the southern division of the fruit company, whose headquarters are in New Orleans. She is of 2,012 tons gross and 1,251 tons net, and was built at Bergen, Norway, in 1904. Ever since it was put into commission the big dock has had all the work it could handle and this fact has led the dock company to decide to build another structure.

Experience has taught the officers of the company that there is a big demand for a small dock, say of about 1,200 to 1,500 tons, and consequently they are now negotiating for the material for the new structure. The new structure is to cost something in the neighborhood of $50,000, and if practicable will be built at New Orleans. When completed it will be moored in front of where the big 5,000-ton dock now floats just off the Algiers point.



NEW DRY DOCK OF THE NEW ORLEANS DRY DOCK & SHIP BUILDING CO., WITH STEAMER ELLIS IN IT.

In the meantime the dock company is going ahead with improvements, and already has begun the erecting of a pier 60 ft. wide by 200 ft. long. Such a wharf was needed and accordingly its construction was authorized. It is directly in front of the property of the company and opposite the big dock. Before very long it is intended to take up the matter of building machine shops and equipping an entire ship building and ship repairing plant. As yet, however, the company is not in a position to begin these extensive operations.

The Ocean Steamship Co., Savannah, Ga., has issued $350,000 worth of bonds for the purpose of paying two-thirds the cost of the steamer now under construction at Roach's ship yard, Chester, Pa., for the company. The other one-third will be paid out of the company's treasury.

Generated on 2024-08-30 17:57 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

THE MARINE REVIEW

DEVOTED TO EVERYTHING AND EVERY INTEREST CONNECTED OR ASSOCIATED WITH MARINE MATTERS ON THE FACE OF THE EARTH.

Published every Thursday by

The Penton Publishing Company

CLEVELAND.

CHICAGO: MONADNOCK BUILDING.
PITTSBURG: PARK BUILDING.
NEW YORK: 150 NASSAU STREET.

Correspondence on Marine Engineering, Ship Building and Shipping Subjects Solicited.

Subscription, $3.00 per annum. To Foreign Countries, $4.50. Subscribers can have addresses changed at will.

Change of advertising copy must reach this office on Thursday preceding date of publication.

The Cleveland News Co. will supply the trade with the MARINE REVIEW through the regular channels of the American News Co.

European Agents, The International News Company, Breams Building, Chancery Lane, London, E. C. England.

Entered at the Post Office at Cleveland, Ohio, as Second Class Matter.

April 5, 1906.

THE SHIPPING BILL.

During the present week consideration is to be given to the shipping bill in Washington. Reports indicate that the probability of a favorable report from the committee on merchant marine and fisheries is better now than it has ever been, and that the temper of the house is favorable to the extension of government aid to shipping in the foreign field. Political considerations, into which it is not necessary to enter, but which are entirely apart from the shipping measure itself, have prevented consideration of the shipping bill until now. The house is extremely anxious that the senate shall pass certain measures in which it is interested and desires some expression upon them before the senate's shipping bill is taken up.

From time to time there has been talk in the newspapers of the powerful lobby in Washington maintained by interests favorable to the shipping bill. As a matter of fact no such lobby exists. The advocates of the shipping bill at present in Washington have come from the middle west. They have no interest beyond a patriotic one in the subject, and they are paying their own expenses. The real lobby is on the other side and is being maintained by foreign shipping interests who are extremely anxious that 91 per cent of our foreign commerce shall continue to be carried in foreign ships. The shipping situation of the United States, however, has gone beyond mere commercial considerations. It has grown to such a stage as to menace its national security. In the event of war, as has been very clearly pointed out by the secretary of war himself, it would be impossible for the United States to mobilize troops oversea, not having the necessary vessels. Moreover, unless the sea habit is bred in the American people by a naval reserve and a capacious merchant marine, the time must speedily come when there will be no men to man our naval vessels.

Already the situation on the Pacific ocean is a serious one. Japan, which heavily subsidizes her merchant marine, is growing and it is an open secret that she has an option at present on the American-Australian line, to become operative if the shipping bill fails. It is understood that she is bidding for the Pacific Mail line. Subtract these tonnages and where are the vessels to be secured to protect our own interest in the Philippines? Ships cannot be got in a day. It takes nearly a year to build them.

The present shipping bill is the fairest measure that has ever been projected to remedy the evils outlined in this article. It puts no direct tax upon the people; it takes no money directly out of the treasury; all that it gets it gets from shipping through tonnage dues, and it is the purpose to redistribute it so that the American ship may get a fairer show. There can be no possible objection to giving this measure a fair trial.

SCIENTIFIC LAKE NAVIGATION.

Mr. Clarence E. Long's instructive course in scientific lake navigation begins in the current issue of the MARINE REVIEW. It is safe to say that this course will be diligently read by practically every master on the lakes, and that they will derive a great deal of benefit from it. The course is confined exclusively to lake navigation and is the most practical service that any publication has so far endeavored to give to the active lake marine. The lessons are simple and concise. The purpose in compiling the course has been to make scientific navigators out of lake masters without the necessity of compelling them to extract the necessary knowledge from the voluminous works upon navigation which now exist. The problems discussed are the practical every-day problems that every lake master meets in taking his vessel from port to port. Mr. Long's services are at the disposal of every master on the lakes who desires to question him. Any master is privileged to send his deviation table ashore and have it analyzed. It is hoped that every master will take advantage of the course and will take a personal interest in the question and answer department. By this means the greatest knowledge can be disseminated in the quickest way.

Generated on 2024-08-30 18:02 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

LAUNCH OF STEAMER THEODORE ROOSEVELT.

THE SILVER ENCASED BOTTLE.

The steel passenger steamer Theodore Roosevelt, building for the Indiana Transportation Co., of Chicago, was launched at the yard of the Toledo Ship Building Co., Toledo, at eleven o'clock Saturday morning. The steamer was christened by Miss Genevieve Mott, the daughter of John G. Mott, one of the directors of the company. As soon as the vessel had taken the water successfully, general manager Greenebaum sent the following message to President Roosevelt: "The steamer Theodore Roosevelt, just launched, sends greetings to the president, for whom it is named."

MISS GENEVIEVE MOTT.

Following the launch, which was successful in every way, luncheon was served in the mold loft. Those present were:

From Michigan City, Ind., S. W. Larsen, G. Boeckling, Albert Ohming, I. I. Spiro, F. H. Willson and wife, John Faulknor (Michigan City Dispatch), W. B. Manny (director Monon railway), Dr. A. Tillotson and wife, Oscar Numer and wife, Bismarck Numer and wife, Phillip Zorm and niece, A. Meisner (News), Mayor E. Schultz, Miss E. Ludlow, B. Burkhardt, George Staiger, Herm Ziese and wife, Captain O. E. Parks and wife, W. Brinkman, L. Wolf and wife, H. Krouze and brother.

From Chicago, M. S. Greenebaum, W. K. Greenebaum, John Greenville Mott and wife, Miss Genevieve Mott, Oscar Romel and wife, Harry Cohen (Dunkley Williams Co.), H. B. Senton (Dunkley Williams Co.), G. Biggio, W. J. Wood (naval architect), Joseph Berolzheim (Manitou S. S. Co.), T. Prindiville, J. Jones, E. J. Flemming and wife, Joseph Wintharbothom & Son, W. Boyle.

From Laporte, Ind., Dr. A. Graves, A. R. Brown.

From Detroit, George W. Fowle, Captain C. H. Wescott, Hon. W. C. Mayburry, Captain Alfred E. Eade, Captain T. Lemay, Frank Jeffrey (Detroit Ship Building Co.), T. P. O'Connor, F. F. Burtless, Mrs. Mary I. Grandy, Miss Etta A. Grandy.

From Dayton, R. C. Finch, Joseph Parker (National Cash Register Co.)

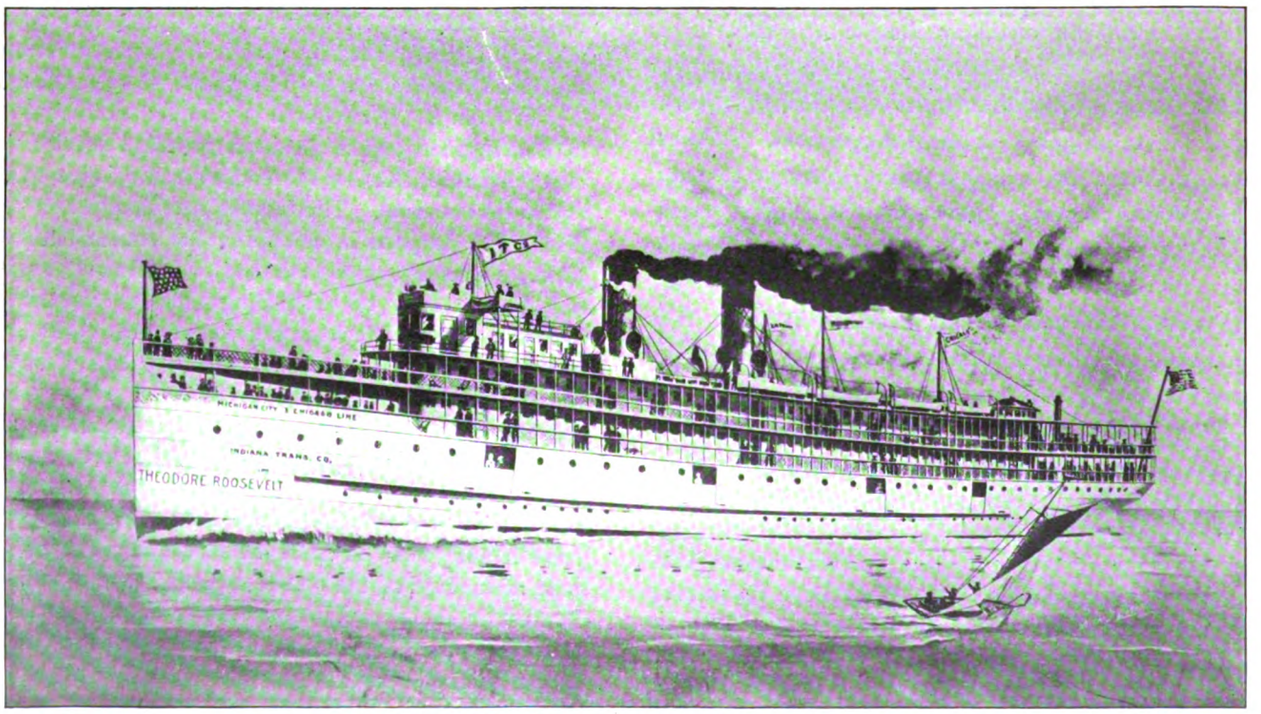
From Cleveland, J. W. Sturtevande and H. N. Herriman.

From Oberlin, H. J. Marsh.

From Oak Park, Ill., Thomas W. Winder and son.

From Toledo, R. A. Bartley, C. F. M. Niles, Edwin Jackson, Clark A. Browning, I. E. Knisely, Miss Mary Howland, Miss Ida Eckert Lawrence, George L. Craig and wife, C. B. Calder and wife, E. Hopkins, A. Black, H. N. Shepherd, Charles Warwick and wife, Capt. Donald McLean.

The Theodore Roosevelt is 270 ft. keel, 40 ft. beam and 16 ft. deep. She is equipped with quadruple expansion engines with cylinders 30, 48, 56 and 56 in. diameters by 40-in. stroke, supplied with steam from two Scotch boilers, 11 ft. 6 in. by 11 ft., allowed 200 lbs. pressure. The hull is subdivided into seven compartments and is practically unsinkable. She is the largest passenger steamer that has been built at Toledo. She will be a speedy boat and will make the distance from Chicago to Michigan City in two hours, making



THE STEAMER THEODORE ROOSEVELT AS SHE WILL LOOK WHEN COMPLETED.

Generated on 2024-08-30 18:00 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

two round trips five days in the week and three round trips on Saturdays and Sundays. She will be sailed by Capt. Donald McLean and her chief engineer will be Charles Warwick.

FREIGHT SITUATION.

Vessel owners are not anxious for an early opening of navigation, and a general start will not be made until April 20 or thereabouts, unless weather conditions take a decided change. There is no advantage to be gained in forcing the opening. Two steamers have left for upper lake ports and their progress will be watched with interest. One is the steel steamer W. A. Rodgers with coal for Milwaukee and the other is the wooden steamer Clyde with coal for Chicago. Both sailed from Buffalo Monday night, making an early opening for this port which is usually the last one on Lake Erie to open. The harbor at Buffalo has been comparatively free from ice for several days past. There is considerable ice in Lake Erie, however, the steamer Lyman C. Smith left Buffalo late Sunday afternoon taking about thirty-six hours to make the trip from that port to Lorain. She experienced considerable trouble with the ice.

During April, 1905, 1,195,173 tons of ore were moved. Ore shippers do not expect to move much more than this during the present month. Reports from upper lake ports indicate that the ice in the straits of Mackinaw and in White Fish bay is quite thick. It is expected, however, that as soon as the ore begins to move it will come down in a perfect torrent. Up to June 1 last year 5,814,604 tons of ore were moved and this record will probably be exceeded this year. Supt. Owens, of the Duluth & Iron Range road, announces that the loading of cars and the forwarding of ore from shaft No 2 of the Fayal near Eveleth and the Elba will begin this week. Should the docks become congested before navigation opens, the ore will be loaded directly into vessels.

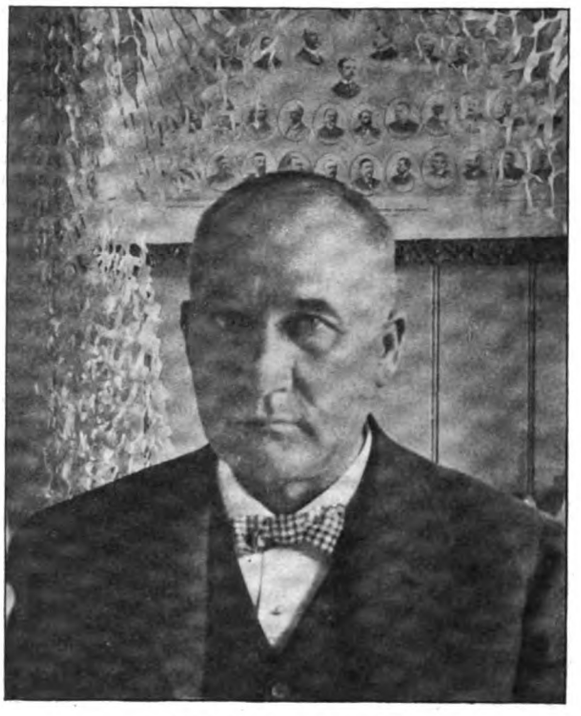
LABOR SITUATION.

The executive committee of the Lake Carriers' Association has now concluded settlements with all the labor organizations except those controlled by the Longshoremen. There is a slight hitch, however, with the engineers' association and the package freight lines. The engineers' association wants three engineers on all package freight steamers of over 3,000 tons. This ruling would affect about twelve steamers and the representatives of the package lines in the executive committee of the Lake Carriers' Association felt that they could not grant it. The engineers held a further conference at Buffalo with Edward Smith and T. T. Morford of the Lake Carriers' committee and insisted upon the employment of a third engineer. This was flatly denied and the engineers have now ordered all their men off the package freighters. The difficulty is not regarded as serious, however, and it is expected that a satisfactory adjustment will be made.

Experience has shown that students studying by self-instruction are particularly diligent and earnest in their work. This is because they are, as a class, more mature, and have learned by experience to take a more serious view of life's voyage. If some of them have had particularly no education to begin with, they need not be discouraged, for in any case they always start at the bottom with the most elementary principles. Any man who has perseverance and a thirst for knowledge can overcome the lack of early education and become a successful navigator.

OBITUARY.

Mr. Henry A. Hawgood died at his home in Cleveland on Tuesday morning last. He had been seriously ill for many months and while his condition was at various times critical, he seemed to possess such remarkable rallying powers that hope of his ultimate recovery was never abandoned. Mr.



MR. HENRY A. HAWGOOD.
From a Group Picture.

Hawgood was sixty years old and was born in Wales, coming to this country with his parents at the age of five years. They settled on a farm near Milwaukee. Mr. Hawgood began sailing on the steamer Bradbury when sixteen years old and was chief engineer at the age of eighteen. He served as chief engineer on a number of steamers for about twelve years. Then he went into business for himself, buying the barge Chicago Board of Trade, and sailing it as master. He rapidly added to his fleet of barges until it became necessary for him to remain ashore in order to manage them. He came to Cleveland in the spring of 1888, and took his place among the leading and progressive vessel owners of the city. Mr. Hawgood's latest boat, the Harvey D. Goulder, was launched only on Saturday last, and is among the finest on the lakes, Mr. Hawgood being among the first to recognize the economy of the large ship. In fact it was he who, in a way, inaugurated the era of the big ship, for the Curry when he built her in 1893 was the largest vessel on the lakes, so large in fact that it was deemed unsafe to put her engines aft, so they were located amidships. They were put aft only two years ago. He was one of the best-known and best-liked vessel owners on the lakes and sincere regret is expressed at his death. He leaves a widow, son and daughter.

Capt. H. S. Albrecht died at Manitowoc on Saturday last. He was born in Denmark about sixty years ago and was originally a salt water sailor. He sailed on the great lakes, however, from 1844 to 1896, and built quite a number of schooners.

The Cunard Steamship Co. this week declared a dividend of 4 per cent after providing fully for the depreciation and putting $250,000 in reserve.

Generated on 2024-08-30 17:59 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

SCIENTIFIC LAKE NAVIGATION.

By Clarence E. Long.

PREFACE TO ARITHMETIC.

This lesson is intended to be self-explanatory; help from a teacher being unnecessary.

The aim of the writer in the preparation of this first lesson—Arithmetic—has been to furnish a treatise on the subject of Arithmetic as applied to practical navigation. Complete, though not inexhaustive, it is a comprehensive manual for the self-taught student; and, therefore, embodying every necessary form of illustration and exercise.

In the writing and arrangement every consideration has been given to the peculiar conditions under which the lake navigator labors; and for this reason nothing has been stated that is not applicable to the theoretical learning and practice of scientific lake navigation by self-instruction.

We have aimed to secure several results; namely, simplicity and clearness; how to reach and arrive at the fundamental principles of the study at once without unnecessary labor; and a proper understanding of the reasons for the steps in the explanation of processes and the solution of problems.

There are many good Arithmetics in print, but none are devoted to this special study, nor adapted to self-instruction. While the ordinary Arithmetic contains much along this line, it is scattered through so many pages and so smothered by their surroundings that the untutored would be at a loss to even know where to start, let alone to understand it. In the present treatise, however, the whole subject is presented in a compact, though complete form, so that the student always starts at the beginning of the study and is led step by step. Nothing is stated, only that which is absolutely necessary to a full understanding of the science; thus, the student is spared any chance of being led from the proper course of study.

The treatment of every topic from the beginning to the end of the book, is thoroughly inductive.

In this way, and by carefully constructed analyses, applied to all the various processes of the study, the pupil's mind cannot fail to become thoroughly imbued with clear and accurate ideas in respect to each particular topic before he is required to learn, or apply to written examples, any set rule whatever.

Definitions and principles should be carefully committed to memory. A definition is a basis for thought and reasoning, and every word which it contains is necessary to its integrity. With a clear understanding of a definition comes the understanding of its principle and process. With the principle and process understood the rule or definition suggests itself. There are cases where the process explains the rule, instead of the rule explaining the process.

In every-day practice the process learned in the ordinary way—parrot-fashion—are of little value because they are not the natural processes of the practical man. Students who learn to work examples in a mechanical way often find themselves unable to solve, with certainty, very simple problems, because they have been taught a school method instead of a natural method. The author has therefore, adopted natural and practical methods of computation wherever they could be wisely substituted for the ordinary processes.

The student should be careful not to advance too rapidly. The mind needs time to grasp and hold firmly every new case, and then additional time to bring its new acquisition into relation with those preceding it. Hence, the need of frequent reviews, in order to give the pupil a comprehensive as well as accurate and permanent knowledge of the subject.

Seek to cultivate the habit of self reliance. This once attained, leads to acquiring that most important of all mental habits, that of thinking and reasoning for yourself. One does not learn to think by mere thinking, but he learns to think correctly by thinking under guidance. There are many guiding posts in the lessons following so that the student will have every chance and opportunity of thinking correctly.

Learn to be observing. Train yourself to be observing by cultivating the mind in that direction. Think for yourself and reason for yourself; do not have, or expect, some one else to do it for you; and above all learn to rely upon yourself. These are necessary requirements for the student to acquire for a firm basis on which to build beneficial and lasting knowledge.

The student should make it a point to investigate the "whys" and "wherefores" of the various rules and principles involved in the different subjects so that he may intelligently understand what he is to do and why it is done. Never learn rules or principles parrot-fashion. Learn the principles and processes, then if possible, frame your own rules. If you know why you are doing a certain thing you can always give a reason; this reason then should be your rule. Such rules will be living and lasting rules, not easily forgotten.

The student should never permit himself to accept any statement as true which he does not understand. Learn it not by authority, but by practical demonstration, which he can always, in some manner or other, devise for himself. By these means the student is led to employ real methods of solution because they are generally natural methods, and to understand and explain every step in this process. A student who has been trained in this manner will never forget a process or a rule, because he can devise the process and frame the rule at will.

As a rule, the average sailor is backward in Arithmetic—not because he isn't able to learn it, but simply because he has not had the advantages of such training, and the practice of employing it. Arithmetic is practically the foundation of navigation, and is essential to an understanding of same. When the practical man desires information of any kind, whether it be his distance off a rocky reef that he is about to pass, or the acquiring of any study that will tend to further his interests, he wants to proceed to business at once, without coming "in stays" and beating back and forth. It is the main points that he wants, and if there be any beating and tacking to be done these are the points to tack on. This is precisely the manner in which these lessons are arranged.

The order and arrangement of the subjects, though they are in some respects a departure from that usually given, will hasten the pupil's progress because one is a stepping stone to the other, and each subject follows in the order in which it is to be learned.

This work is of sufficiently comprehensive scope to meet the demands of even the most advanced schools and standard books on navigation. The unusually practical character of the problems will be discerned by a mere glance through its pages. After the rules, principles and processes have been explained, practical examples are given to show their application in every-day lake navigation. This is the kind of knowledge that counts. Such knowledge is "real," not theoretical knowledge.

The student should carefully read over several times, with due thought and deliberation, each subject in its order. In this manner he acquires a theoretical knowledge of the principles underlying the subject. Then he is to go back and commence at the beginning of each subject, and put its theory into practice by acquiring its rules and working its processes. This is the proper course to pursue in order to obtain the necessary basis or ground-work, so essential to the thorough and comprehensive understanding of any study.

The student should not become discouraged if he is unable to grasp the meaning of each principle at first sight. Should this at any time occur, after giving it the required amount of study, either throw it from the mind entirely for the time being, and take up the subject following it. Many times the student will be able to grasp the following subject more readily than the one preceding it, for it may happen to appeal to him, whereas the other did not. Thus, the following subject ofttimes helps to explain the preceding subject, since one is a stepping stone to the other.

The learning of one subject increases one's power to master another along the same lines. It is also a fact that the study of a branch of knowledge that trains several powers of the mind may increase its capacity to master other branches that appeal to these powers.

Go slow and begin at the beginning. Be sure to do everything thoroughly that you attempt to do.

ARITHMETIC OF PRACTICAL NAVIGATION.

WRITTEN ESPECIALLY FOR THE BEGINNER.

The arithmetic of practical navigation is extremely simple and is included in the following:

It is supposed that the four fundamental rules of Arithmetic are clearly understood by the student.

LESSON I.—PART I.

The first lesson in navigation is the arithmetic of navigation.

ARITHMETIC OF THE COMPASS.

The first thing to be done by the pupil is to learn and memorize the table of circular, or angular measure; in other words, the degrees °, minutes ′, seconds ″, into which every circle of circumference, is divided, and by which it is measured.

This is very essential since this part of mathematics

Generated on 2024-08-30 17:58 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

enters into the first and important problems of the compass and navigation. Angular or circular measure is employed in converting points and fractional points of the compass to their equivalents in °, ′, ″ of a circle, such as one compass point equals 11° 15′ of a circle or circumference, or 11° 15′ of arc; or vice versa, degrees, minutes and seconds, turned into points and fractions of a point, such as 2° 48′ 45″ of a circle, or of a circumference, or of arc, equals one-quarter point of a circle or circumference—32 points altogether, and one-quarter point would be one-quarter of 1-32; in denoting the amount of the variation and deviation of the compass, such as the Var. is 6° westerly, meaning that the compass needle or card, is drawn to the left of its supposed true direction by a half point, or practically 6° of a circle; in connection with the measurement of all angles, such as measuring the angle (amount) of the variation and deviation from their respective initial points, also in measuring the three angles of any triangle; in the processes known as correcting courses, or the conversion of courses, that is, to apply the variation and deviation to the course steered or to the course to be steered; by laying the course on the chart and by the angle (the number of degrees and fractions of a degree) it makes with the meridian, as found from the chart, compass and parallel-ruler, or otherwise; in the taking of bearings, azimuths, etc.; in longitude of arc and in longitude of time, and in reckoning latitude; as for instance: the latitude of the lighthouse situated on the north pier at Milwaukee, is located on the parallel of 43° 02′ north of the earth's equator, the equator being the theoretical line from which latitude is reckoned, or the zero point of latitude. As each (mean) degree of latitude is equal to 60 (mean) nautical miles or minutes (6080 feet in a mean nautical mile or minute of latitude) this would be 60′ × 43 + 2′ (43° reduced to by multiplying by 60 plus 2′) or 2,582 minutes, or miles, true north of the equator, all of which will be explained in a subsequent lesson.

Here is the table of circular measure, which is similar to the table of time measurement. Learn this thoroughly, for it is the foundation of compass and chart work.

CIRCULAR MEASURE

Or, Division of the Circle,

Used in navigation, astronomy, geography and surveying; also for calculating the differences of time.

Table.

60 thirds (‴).....1 second....."
60 ″ .....1 minute....'
60 ′ .....1 degree....°
360 ° .....1 Circle or Circumference.

The scale of unit is 60;

Or, more fully, as follows:

60 thirds (marked thus ‴) make 1 second (marked thus ″) of a circle, or circumference.

60 seconds (″) make 1 minute (marked thus ′) of a circle.

60 minutes (′) make 1 degree (marked thus °) of a circle.

360 degrees (°) make 1 circle (marked O).

Three slanting ticks (‴) placed at the right and a little above any figure, or figures, denotes thirds, 60 of which make 1″. A third (‴) is the name given to the sixtieth part of a second of arc.

Two slanting ticks (″) placed in the position as above-described, denotes seconds, 60 of which make 1′. A second (″) is the name given to the sixtieth part of a minute of arc.

One slanting tick (′) placed in the position as above-described, denotes minutes, 60 of which make 1°. A minute (′) is the name given to the sixtieth part of a degree of arc.

A small circle (°) placed as above described, denotes degrees, 360 of which make 1 circle; or more compactly thus:

60‴ equals 1″ of a circle, or circumference.
60″ equals 1′ of a circle.
60′ equals 1° of a circle.
360° equals 1 circle O.

EQUIVALENTS.

O	°	′	″	‴
1 =	360 =	21,600 =	1,296,000 =	77,760,000.
	1 =	60 =	3,600 =	21,600.
		1 =	60 =	3,600.
			1 =	60.

The foregoing table is read thus: 1st line—one circle equals three hundred sixty degrees; three hundred sixty degrees equals twenty-one thousand six hundred minutes; twenty-one thousand six hundred minutes equals one million two hundred ninety-six thousand seconds; one million two hundred ninety-six thousand seconds equals seventy-seven million seven hundred sixty thousand thirds;

The second line reads: one degree equals sixty minutes; sixty minutes equals three thousand six hundred seconds; three thousand six hundred seconds equals twenty-one thousand six hundred thirds.

3d line: one minute equals sixty seconds; sixty seconds equals three thousand six hundred thirds;

4th line: one second equals sixty thirds.

The first line shows the number of degrees, minutes, seconds and thirds into which the circle is divided.

The second line shows the number of minutes, seconds, thirds, into which the degree is divided.

The third line shows the number of seconds and thirds into which the minute is divided;

The fourth line shows the number of thirds into which the second is divided.

Note.—The parenthesis mark is an upright curved line, and the parentheses (plural) are two upright curved lines ( ) used to set off, or to include words parenthetically. The novice should not confuse the parentheses marks, or signs ( ) as having anything to do with the marking of degrees, minutes, seconds and thirds signs, as (°) (′) (″) (‴). In the foregoing lesson the degree signs are inclosed in parentheses to set them off and to separate and show that the name of the sign precedes it, and vice versa, in some of the work following. The degree, minute, second and third signs are always marked after the figures, thus 5° 45′ 15″ 30‴. This is read: five degrees, forty-five minutes, fifteen seconds and thirty thirds.

Note.—The expression *of arc,* or *of a circle,* or *of a circumference,* such as 10° of arc; 10° of a circle, or 10° of a circumference, are used indifferently to mean the same thing. A circle and a circumference are practically the same thing. A circle is a plane figure bounded by a curved line called a circumference, every where equally distant from a point within called the center. Every compass card represents a circle, and the distance round its edge is the circumference; hence, they must be the same. Any part of the circle or circumference is called an arc. A whole circle or circumference contains 360° or 32 points, the compass card for example. Any part less than a complete circle or circumference containing less than 360° or 32 points is an arc or that much of an arc of the circumference. 20°, three points, 480′ are each an arc of a circle; for instance: the arc of 20° is 20° of a circle, or 20 parts of the 360 parts; 3 points is an arc of 3 points of a circle, or 3 parts of the 32 parts, and 480′ is an arc of 480′ or 480 parts of the 21,600 parts, or the number of ′ (minutes) into which the circle is divided. From north to east on the compass is 90°, or 90° of an arc, or an arc of 90°.

Note.—The division of the second ″ into thirds ‴ has probably never been mentioned heretofore, in any arithmetic. To prevent possible confusion we make this statement: In turning fractional points of the compass into degrees and fractions of a degree, in some cases there is one second left over; what to do with this one second puzzles the average person. If they have been dividing by 2 they know that it is a half a second. For example: 2° 48′ 45″ equals ¼-point; half of this would equal ⅛-point; thus, half of 2° is 1°; half of 48′ is 24′ and half of 45″ is 22″ and 1″ over; 1″ equals 60 ‴, and half of 60‴ equals 30‴; therefore, half of 2° 48′ 45″ is 1° 24′ 22″ 30‴. or 22½″. Every table of circular measure starts off with 60″ equals 1′, etc. The first thing that naturally suggests itself is what makes seconds; something must be responsible for it. The answer, as we have seen, is thirds, 60 of which make 1″. The same question may be asked, what makes thirds; the answer is fourths⁗; hence 60⁗ equals 1‴; what makes fourths; fifths makes fourths, hence 60⁗⁗ equals 1⁗. It will be seen from this that these subdivisions of the degree can be carried on indefinitely; but just imagine what an enormous amount it would be; if carried very far it would become incomprehensible, nevertheless, they exist. All this in practice has no value, though it is well to know why it is.

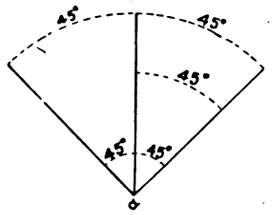
Note.—A good illustration of this second and minute division is

Generated on 2024-08-30 17:58 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

the performance of the second, minute and hour hands of a watch or clock. While the second hand ticks off 60 seconds (making a complete revolution) the minute hand moves forward or passes over but 1-60 of its circumference, or in other words, describes an arc of 1 minute, and during the time that the minute hand is making a complete revolution through 60 minutes of space the hour hand advances through 1 hour of space, or what is equivalent to 60 minutes; therefore the second hand ticks 60 times while the minute hand ticks 1, and while the minute hand ticks 60 the hour hand ticks 1; therefore, 60 second ticks equals 1 minute; 60 minute ticks equals 1 hour, or 60 minutes. During the time that the minute hand makes a complete revolution, the second hand makes 60 revolutions, or 60 × 60 seconds, equals 3,600 seconds; therefore, 3,600 seconds equals 60 minutes.

Now, supposing that there was another hand on a watch or clock that would indicate the next denomination lower than seconds, what would its performance be. In the first place it would be called the "third" hand, meaning not that there were three hands, but thirds, 60 of which make a second. This hand in indicating thirds would have to tick 60 times, or make one complete revolution, while the second hand ticked one, or moved through one second of space. The construction of such a piece of mechanism would be a most difficult task, though were it possible to construct it, the above would be the principle upon which it would operate.

Now, remember that every circle, no matter how large or how small, contains 360°, that is, the circumference of all circles is divided into 360 equal parts, or graduations, called degrees, and all angles are measured by these. A single glance at the accompanying diagram will illustrate this. The angles at a do not increase in size because



A QUARTER CIRCLE.

their boundary lines are prolonged. If these lines were prolonged till they reached the apparent sky the angle at their juncture (where they meet) would be the same size—45°. A degree, therefore, is 1-360 of the circumference of any circle, no matter what size. Do not forget this important matter. Now, each degree is again divided into 60 equal parts called minutes and each minute into sixty equal parts called seconds, and each second into 60 equal parts called thirds of arc, or of circle.

Every circle, great or small (the compass card is a circle), is also divided into 32 equal parts called points (compass points). The circumference then of every circle, no matter what its size, is divided into 32 equal parts called points, and all angles can likewise be measured by them.

Now, you will readily see that it would take a circle of very large circumference in order to put in all the subdivisions, or graduations, belonging to the degree, but, they are there, nevetheless; even though the space between the degree graduations are not large enough to contain these smaller subdivisions, such as the ′, ″, ‴ of the degree. Practically speaking, they are not there, that is, they are not there so they can be seen, but theoretically, they are.

Now, if there are 360° to every circle how many minutes (′) will there be in 360°?

360 × 60′ = 21,600′

How many seconds then to a circle?

360 × 60 × 60″ = 1,296,000″

How many thirds then to a circle?

360 × 60 × 60 × 60‴ = 77,760,000‴

You will see from this that there isn't any difference between 360° and 21,600′ or 1,296,000″ or 77,760,000‴.

Now, if you have a full understanding of what has already been said you will see that 360° and 32 compass points are practically the same thing. Then, 180°, or a semi-circle (one-half of a circle) contains 16 points, one-half of 360° being 180° and one-half of 32 is 16. Every circle is divided into four equal parts call quadrants, each containing 90°, or 8 points (¼ of 360° is 90° and ¼ of 32 is 8).

One-eighth of a circle is 45°, or 4 points (⅛ of 360° is 45°, and ⅛ of 32 is 4, or ½ of 90° is 45°, and ½ of 8 points is 4 points).

One-sixteenth of a circle is 22° 30′, equals two compass points (360 ÷ 16), or ½ of 45° is 22½°, or 22° 30′; therefore, 1-32 of 360° is 11¼° = 11° 15′, or ½ of 22½° is 11¼°, or 11° 15′, all of which will be explained in another lesson.

Note.—If it bothers you to remember how many minutes of arc in a degree of arc; how many seconds of arc in a minute of arc, etc., try this: Let ° stand for hours, ′ for minutes of time, and ″ for seconds of time.

COMPOUND DENOMINATE NUMBERS.

A compound denominate number expresses two or more denominations of the same kind.

40° 15′ is a compound denominate number.

40° is a simple denominate number.

17 yards 1 foot 9 inches is a compound denominate number, because it expresses two or more denominations of the same kind.

REDUCTION.

Reduction is the process of changing a denominate number from one denomination to another without altering its value.

REDUCTION DESCENDING.

The changing of a denominate number to an equivalent denominte number of a lower denomination is called reduction descending.

Reduction descending is to reduce from a higher to a lower denomination; as 5° = 300′; 300′ = 18,000″; 18,000″ = 1,080,000‴, or thus, 5 × 60′ = 300′; 300 × 60″ = 18,000″; 18,000 × 60‴ = 1,080,000‴. That is to say, 5° equals that number of minutes, seconds, thirds.

5° in each case is reduced to a lower denomination, but its value is not altered in the least.

Explanation:—Since there are 60′ in 1°, in 5° there are 5 times 60′ = 300′; again, since there are 60″ in 1′, in 300′ there are 300 times 60″ = 18,000″; again, since there are 60‴ in 1″, in 18,000″ there are 18,000 times 60‴ = 1,080,000‴.

Rule.—Multiply the number of the highest denomination given, by the number indicating how many units of the next lower denomination are equal to one of the higher, and to the product add the number given of this lower denomination. Proceed in like manner with this and each successive result thus obtained, until the number is reduced to the required denomination.

Example:—Change 40° 15′ to ′ (minutes).

40	We multiply by 60 because it takes 60′ to make a degree. 2400′ is the same thing as 40°, only this expresses it in a lower denomination. We add in the 15′ because they are of the same denomination; hence, 2415′ is the same as 40° 15′.
×60′	
2400′	
+15′	
2415′	

Change, or reduce 5 yards 9 feet to feet.

5	3 feet to the yard, hence 3 × 5 = 15 + 9 = 24. 24 feet or 5 yards 9 feet are one and the same.
×3 ft	
15 ft	Change, or reduce:
+9 ft	15° 14′ 30″ to ″ (seconds) Ans. 54870″. 15 × 60′ + 14′ × 60″ + 30″ = 54870″, because 60′ = 1°; 60″ = 1′, etc. 60 is always the basis in degree, minute and second work. This degree work is on the same principle as yards, feet and inches, or gallons, quarts and pints.
24 ft	

Change 15 gallons to pints. Ans. 120 pints.

Generated on 2024-08-30 17:58 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

4 quarts to the gallon and 2 pints to the quart, or thus, $15 \times 4 \times 2 = 120$.

Note.—In using the foregoing rule, numbers should be considered as abstract, and not as denominate. A number used without reference to any particular thing is called an abstract number. Thus, 4, 7, 9, etc., are called abstract numbers. A number used in connection with something is called a concrete number. Thus, 5 degrees, 4 books, 7 days, 8 dollars, are concrete numbers. In multiplication the multiplier is always regarded as an abstract number. The multiplicand and product are like numbers. For sake of simplicity we have reversed this latter rule and made the multiplier a denominate number instead of an abstract. Thus, in the example: change 40° 15′ to minutes; $40 \times 60' = 2400' + 15' = 2415'$. The correct analysis of this would be: we multiply 60′ by 40 because it takes 60′ to make 1° and in 40° there would be $60' \times 40 + 15'$ which is 2415′.

REDUCTION ASCENDING.

Changing a denominate number to an equivalent number of higher denomination is called reduction ascending. Change 480′ to degrees. Ans. 8°. In this case we divide where we multiplied before; thus, 480′ divided by 60, the number of minutes in a degree.

The process of changing a denominate number to an equivalent number of higher denomination is called Reduction to Higher Denominations or Reduction Ascending; as for example: How many degrees in 1740′? Answer, as many degrees as 60′ are contained times in 1740′ because 60′ = 1°. 60′ are contained in 1740′ 29 times, or 29°.

Again, how many degrees in 90,000″. Ans. 25°. Explanation:—Since there are 60″ in 1′, in 90,000″ there are as many ′ as 60″ are contained times in 90,000″, or 1,500′.

Since 60′ = 1°, in 1,500′ there as many ° as 60′ are contained times in 1,500′ or 25°.

To reduce ‴ (thirds) to degrees we divide by 60 three times—once for ″, once for ′ and once for °.

Rule.—Divide the given number indicating how many units of the given denomination make one of the next higher denomination.

Proceed in like manner with this, and each successive quotient, till the whole is reduced to the required denomination.

The last quotient, with the remainders, if any, annexed, will be the required answer.

60 |	2,592,000‴	2,592,000‴ ÷ 60 =
60 |	43,200″	43,200″ ÷ 60 =
60 |	720′	720′ ÷ 60 =
	12°	12°

Change 1740′ to degrees. Ans. 29°.

Change 104,400″ to degrees. Ans. 29°. In a case of this kind we divide by 60 twice, once for minutes, and once for degrees; thus, 104,400″ ÷ 60 = 1740′ and 1740′ ÷ 60 = 29°.

Examples for practice:

Change 17 yds. 1 ft. 9 in. to inches. Ans. 633 inches. Explanation:—Since there are 3 feet in 1 yard, in 17 yds. there are 17 times 3 feet = 51 feet, and 51 feet + 1 foot equals 52 feet. Since there are 12 inches in 1 foot, in 52 feet there are 52 times 12 inches = 624 inches and 624 inches + 9 inches = 633 inches. Hence, 17 yds. 1 ft. 9 ins. = 633 inches.

Change 15 hrs. 16 mins. to seconds. Ans. 54,960 seconds.

Since 1 hour equals 60 minutes, 15 hours equals 60 times 15, or 900 minutes plus 16 minutes equals 916 minutes; and as there are 60 seconds in one minute, in 916 minutes there are 60 times 916, or 54,960 seconds.

Change 4 weeks 6 days 11 hours to hours. Ans. 827 hours.

Since one week is equal to 7 days, 4 weeks will be equal to 4 times 7, or 28 days plus 6 days equals 34 days, and since one day equals 24 hours, 34 days equals 24 times 34, or 816 hours plus 11 hours equals 827 hours.

What part of a circle is it from XII to III on the face of a clock? Ans. 90° The circle face of the clock is divided into 12 equal parts, or hours; therefore, 12 is equal to 360°, and 1-12, or 1 hour, is equal to as many degrees as 12 is contained times in 360° (360° ÷ 12 = 30°); hence, each hour is equal to 30°; and as there are 3 hour divisions between 12 o'clock and 3 o'clock $3 \times 30° = 90°$; or as 3 is contained in 12 4 times it must be ¼ of the circle, or 90°.

How much of an arc is it from IX to X on the clock? Ans. 30°.

What part of a circumference it is from III to VII on the clock? Ans. 1-3, or 120°.

How much of an arc is it from 9 o'clock to 3 o'clock? Ans. 180°. From 9 to 3 o'clock is 6 hours and $6 \times 30° = 180°$, or ½ a circumference.

Imagine the minute and hour hand of a clock to be of the same length; the minute hand is on XII and the hour hand is on I. What is the angle formed by these two hands, also, how much is the arc from one hand to the other? Ans. 30°, that is, the angle is 30° and the arc of the circle is 30°.

QUESTION AND ANSWER DEPARTMENT.

This department is conducted for the information and instruction it will render our subscribers in practical lake service, or otherwise. Primarily, its purpose is to be helpful, rather than merely interesting. Are you puzzled by any question in relation to the science and practice of lake navigation, questions that concern your every-day navigation? State your question or problem in writing, and mail it to the Question Department of the MARINE REVIEW. If the question asked or the problem submitted is of general interest, the solution will be printed in these columns. If of merely personal interest, it will be forwarded by mail, provided an addressed and stamped envelope is inclosed for the purpose when the question is sent in.

Rules for Question Department.

Your real name and postoffice address must be on the sheet with the question, initials will not do. Your name is not for publication, but is an evidence of good faith. We reserve the right to decline to answer any question not of general interest, i. e., unless the question and answer is helpful to others.

LUMBER CARRIERS AND LABOR.

The Lumber Carriers' Association has entered into season agreements with the seamen and cooks. The seamen have practically the same schedule as last year with the addition of 25 cents an hour paid for all overtime in port. Cooks on lumber vessels carrying a crew of thirteen men are given $85 a month, which is an advance of $5 over last year's rate. The cook must, however, provide a second cook out of this allowance. In other respects the wages are the same as last year, on boats carying twelve men, $70 a month and on boats carrying eleven men, $60 a month. The wages for cooks on barges and schooners are the same as for seamen. An effort was made to displace women as cooks and it has probably been done by inserting the words "prior to 1905" to the agreement. This clause now reads: "It is understood that vessels of the Lumber Carriers' Association have the privilege of employing women cooks providing they have cooked on boats of the Lumber Carriers' Association prior to 1905." This forbids the hiring of any more women cooks and excludes those who were hired last year.

A bill to place a beacon light at the entrance of Milwaukee harbor has been recommended in committee. This light is to be placed on the south end of the harbor of refuge pier, and will have a third order flash light and be equipped with a fog whistle. The tower containing the light will be about 100 ft. high and the original cost will be in the neighborhood of $200,000.

Generated on 2024-08-30 18:12 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

LAUNCHING OF THE HARVEY D. GOULDER.

MISS ALDYTH O. HAWGOOD.

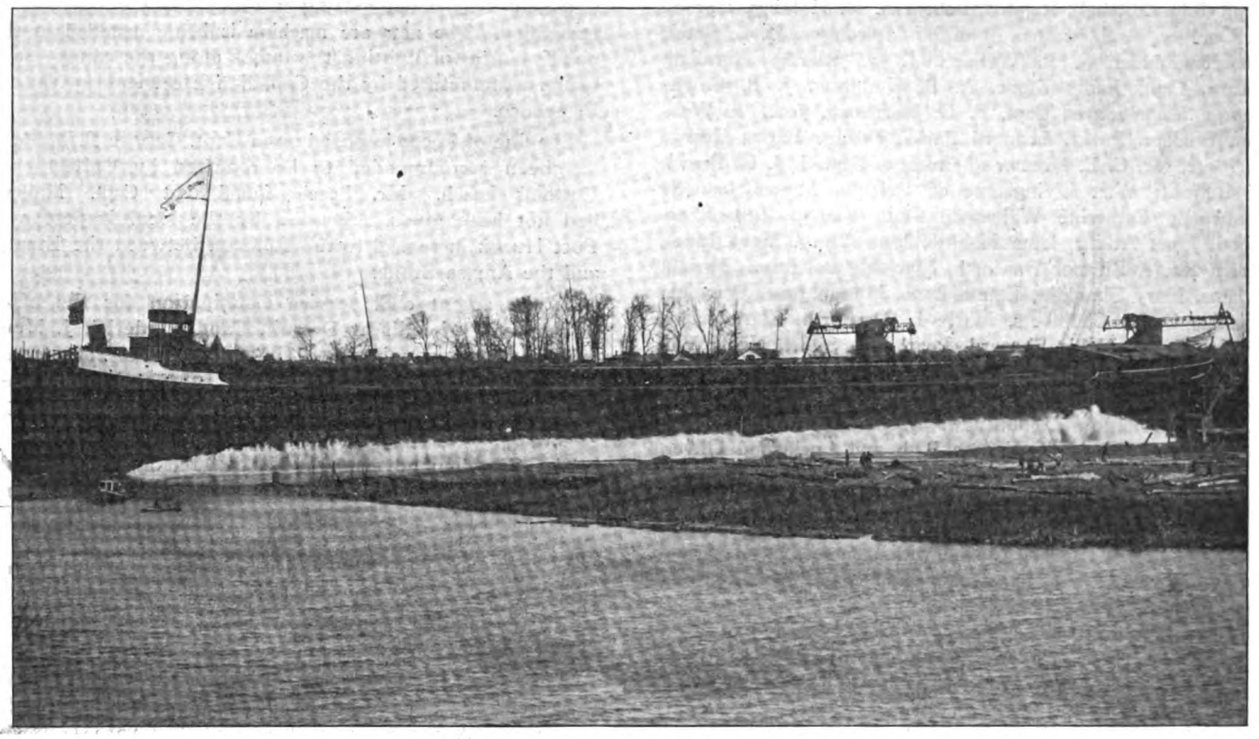
The steamer Harvey D. Goulder, building at the Lorain yard of the American Ship Building Co. for Mr. Henry A. Hawgood, was launched at noon on Saturday last and was christened by Miss Aldyth O. Hawgood, the daughter of Mr. Arthur A. Hawgood, in the presence of an unusually large party. The day was a perfect one and the launch one of the most successful that has taken place at this yard. The guests were taken to the ship yard on special cars and were returned to the Clifton Club where luncheon was served.

The spacious dining room of the large club was beautifully decorated for the occasion. President Wm. Livingstone of the Lake Carriers' Association acted as toastmaster. Mr. Livingstone read letters of regret from Mr. Eugene Tyler Chamberlain, commissioner of navigation, Senator Jacob H. Gallinger of New Hampshire, Mr. T. T. Morford of Buffalo, and Mr. Harry Coulby of Cleveland. Mr. Livingstone then read a little poem written by Mrs. Harvey D. Goulder, which elicited great applause.

MR. HARVEY D. GOULDER.

THE LAUNCHING PARTY ON THE STAND.

Generated on 2024-08-30 17:58 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



LAUNCH OF THE STEAMER HARVEY D. GOULDER.

"Harvey D. Goulder, the man,
Match him, if you can;
Harvey D. Goulder, the boat,
The finest of all afloat;
Little Miss Hawgood,
I'm sure that you saw good;
The youngest and sweetest of all."

In responding to the toast Mr. Goulder said that if the steamer Harvey D. Goulder performed as well as she had been built, she would be a very successful ship. He thanked the company sincerely for naming so splendid a specimen of the ship builder's art after him.

Mr. Arthur H. Hawgood spoke briefly concerning the steamer which he felt was a complete ship to the least detail.

Mr. Homer H. McKeehan paid an unusually fine compliment to Mr. Goulder, recounting some of the hundreds of things that Mr. Goulder has done at his own expense and without hope of reward for his associates in lake trade. Mr. Goulder, he said, was the man that all the other admiralty lawyers on the lakes measured by. He added that all that Mr. Goulder had had been secured through his own efforts. What he has had been earned. He said that it was one thing to be born with a silver spoon in one's mouth, and another thing to be born with handicaps. Any big-mouthed baby can swallow a silver spoon, but it takes a man to file the shackles from off his legs.

Brief speeches were then made by Abraham Stearn and Sheldon Parks, after which a toast was drunk standing to Mr. Henry A. Hawgood, the owner of the ship, who was too ill to be present.

Capt. J. J. H. Brown of Buffalo, in a very happy speech, stated that Mr. Goulder was engaged in a campaign to extend commerce under the American flag to all ports of the world in the same proportion that it is now extended to all the ports on the lakes. He then turned his attention to the chairman and recalled the time when the chairman was the secretary of the St. Clair Towing Co., adding that he was the whole thing in the St. Clair Towing Co., as he is in everything with which he becomes connected. The St. Clair Towing Co. had a tug known as the Zouave, which operated on a sliding scale which, however, worked only one way. When freights went up the towing charges advanced, but when freights came down the towing charge remained where it was, with the result that if an owner had a fleet of vessels he found that he could buy a hull, boiler and engine for the annual cost of towing his fleet to the Detroit river. Owners began to find it more profitable to put on a steamer and do their own towing, not quick enough, however, to prevent the chairman from getting from under and becoming president of the Lake Carriers' Association.

In defense of the St. Clair Towing Co., Mr. Livingstone desired to say that Mr. Goulder was its legal counsel and it had to take care of him.

Brief speeches were made by Capt. John Mitchell, Col. J. Sullivan and Mr. C. E. Kremer, Col. Sullivan stating what a pleasure it was to him to be associated with Mr. Goulder in the work of the Merchant Marine League in which he was quite sure success would eventually crown Mr. Goulder's efforts.

Mr. J. C. Wallace stated that the keel of the Goulder had been laid just eight weeks ago and that she will have a load of coal aboard her on April 20 and be ready for her maiden trip.

"On the great lakes," said Mr. Wallace, "we have got to the point of manufacturing ships. We don't build them any more, the price having got so low (here all the vessel owners present laughed uproariously, but Mr. Wallace continued without a pause) that we don't even try to satisfy our common stockholders. I must state that the Goulder was launched seven minutes ahead of time, this differing very widely from her namesake, who was never known to be on time." This sally at Mr. Goulder's well known failing was received with much merriment.

The concluding speech was made by Mr. George H. Eichelberger, who responded to the toast "The Ladies."

Among those at the launching and luncheon were: Mr. and Mrs. A. W. Hawgood, Mr. and Mrs. W. A. Hawgood, Mr. Harry B. Hawgood, Miss Helen Hawgood, Misses Phillipi and Mary Hawgood of Battle Creek, Mich.; Miss Arla Hawgood, Miss Aldyth O. Hawgood, Mr. and Mrs. James

Generated on 2024-08-30 17:55 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

C. Wallace, Mr. and Mrs. W. C. Cain, Miss Eleanor Mathers, Capt. John Mitchell, Ralph Mitchell, S. H. Holding, Harvey D. Goulder, F. S. Masten, John M. Mulrooney, H. L. Gates, Robert Goulder, J. L. Wallace, J. Q. Riddle, Abraham Stearn, Capt. James Stone, A. B. Hamilton, J. B. Cowle, George Eichelberger, Capt. F. D. Herriman, John T. Webster, Sheldon Parks, Leonard Parks, Horace Parks, George A. Marr, Mr. C. E. Kremer of Chicago, Capt. J. J. H. Brown of Buffalo; Wm. Livingstone of Detroit; Misses Jeanette Walworth, Catherine Walworth, Flora Young, Ruth Sherwood, Janet Atkins, Irma Maedje, Ione Avery, Mary Jones, Helen Reese, Eleanor Danforth, Marjorie Patterson, Miriam Adams, Mary Shanklin, Emma Lane, Minnie Jones, Virginia Martin, Orpha Chambers, Marie L. Danforth, Clara Jenks, Marian Jenks, Nellie Shepard, Pearl Van Sitert, Neola Van Sitert, Nellie B. Snavely; Paul King, George Lannart, J. Horace Jones, Clark D. Adams, Harvey Hawgood, Harold Hughes, Holbrook Cleminshaw, Spencer Ellwood, Harold Green, Ralph Marshall, Horace Rich and Lockwood Oliver.

The steamer Harvey D. Goulder is one of the largest on the lakes, being 545 ft. over all, 525 ft. keel, 55 ft. beam and 31 ft. deep. She has thirty-two hatches spaced 12-ft. centers. Her engines are triple-expansion with cylinders 23½, 38 and 63-in. diameters by 42-in. stroke, supplied with steam from two Scotch boilers, 14 ft. 6 in. by 11 ft. 6 in., equipped with Ellis & Eaves draft and allowed 180 lbs. pressure.

AROUND THE GREAT LAKES

The steamer Harvey D. Goulder will be sailed by Capt. George Robarge.

It is understood that the cruiser New York, which is undergoing extensive repairs at the Boston navy yard, is to be renamed Trenton.

Col. Davis, government engineer at Detroit, has opened bids for furnishing a tug as tender for the work in the lower Detroit river.

As soon as weather conditions permit the McMorran Wrecking Co. will begin the work of raising the sunken steamer Linden in St. Clair river.

C. C. Philpott has been appointed general agent for the Montreal & Lake Superior Line with headquarters at Cleveland, vice R. W. Bartlett, resigned.

The steamer James Laughlin will be launched at the Ecorse yard of the Great Lakes Engineering Works on Saturday for the Jones & Laughlin Co., of Pittsburg.

The keel for one of the steamers building for the Cambria Steel Co. is laid at the Bay City yard of the American Ship Building Co. this week. This vessel is to be 602 ft. long.

Major Charles L. Potter, government engineer at Duluth, is inviting bids for the construction of a new steel tug for government service. About $60,000 is allowed for the construction of the tug.

The Graham & Morton Line, Chicago, has chartered the steamer W. H. Gratwick for a lump sum for the season. The Gratwick is owned by the United States Transportation Co.

The wooden package freighters Russell Sage and J. C. Gault owned by A. W. Colton of Toledo have been purchased by Capt. Moses W. Humphrey of Detroit. Capt. Humphrey will operate them in the lumber trade.

Officers and crew of the Goodrich liner Atlanta which was destroyed by fire on Lake Michigan on March 18, have been exonerated after an examination by the Milwaukee inspector. No blame is attached to the crew or officers.

A force of about twenty men are at work upon the Canadian ship canal getting it ready for the opening of navigation. The new arc machine is being installed in the power house for lighting the lamps along the canal. It is being manufactured by the Canadian Electric Mfg. Co., of Peterboro.

The fine of $1,000 imposed upon Capt. George B. Mallory has been recommended to be remitted by Collector of Customs Leach. Mr. Leach found that Capt. Mallory had not been given a hearing by the local inspector at Port Huron in regard to the collision between the Etruria and the Amasa Stone.

In the recent civil service examination for the office of inspector of hulls at Detroit, Capt. Frederick J. Meno who has been appointed to the position had these averages: Hull construction, 96.50; pilot rules and inland navigation, 93.50; life boats and life rafts, 90; experience, 90. His general average was 92.65.

The Canadian government has erected a lighthouse on the northeastern end of Welcome island in Thunder bay, Lake Superior. The lighthouse stands on land 80 ft. above the lake level and 150 ft. back from the water's edge. It is 38 ft. high from its base to the top of the ventilator on the lantern. The light will be a fixed white one 112 ft. above the surface of the water and it is expected will be visible for sixteen miles.

The Detroit, Belle Isle & Windsor Ferry Co., of Detroit, is casting about for a name for the companion steamer of the Columbia. A name preferably beginning with C is desired. The company is offering a prize of $10 and an annual pass for a name for the steamer and it is understood that about 15,000 names have been suggested. Certain friends of the company are using their influence to have the boat named Caloric.

The new lighthouse tender Aspen, building at the yard of the Toledo Ship Building Co., Toledo, will be commanded by Jacob N. Lanstra of Detroit, who has been first officer on the lighthouse tender Marigold. Alfred Bernier, the first officer on the steamer Amaranth of the lighthouse engineer service, is transferred at his request to the same berth on the Marigold.

A public hearing under the direction of Lieut. Col. Dan C. Kingman, government engineer, will be held in the Chamber of Commerce, Cleveland, at 10 a. m. April 10, upon the application of the Board of public service of the city of Cleveland for permission to rebuild the Central viaduct across the Cuyahoga river so as to remove the center pier from the river and also the entire draw plan, replacing it by a single fixed span. It is suggested that all communications be submitted in writing.

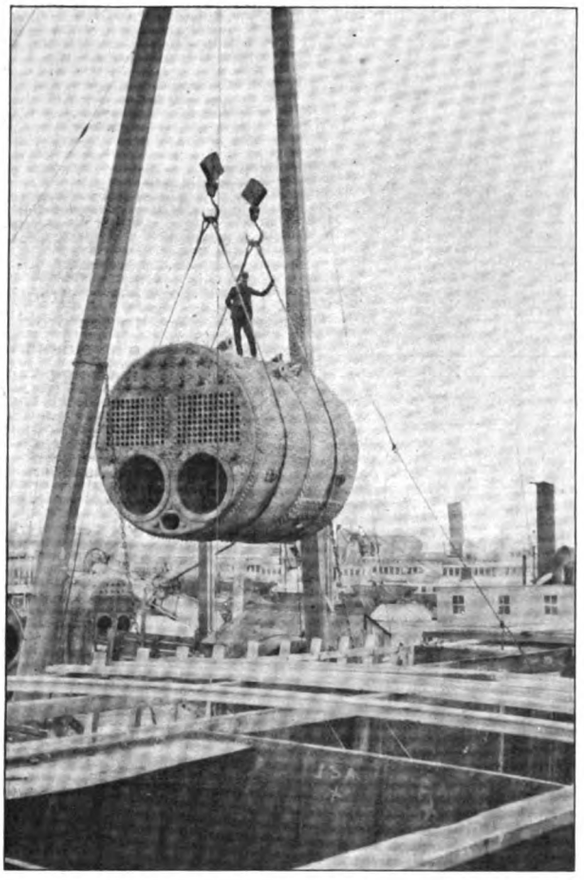
Mr. George Clinton one of the members of the International Waterways Commission, speaking of the preservation of Niagara Falls, said that there was but one way to save their beauty and that was by treaty between the two countries. He added that if such an arrangement were not made, it would only be a short time comparatively before Niagara would be merely the ruins of a once historic spot. He says that all outstanding charters should be revoked and that those now actually in force should be limited to 64,000 cu. ft. per second.

On Monday, March 19th, Judge Joseph Buffington of the United States district court of western Pennsylvania, sitting at Pittsburg, handed down decrees in the two suits for patent infringement of the Stirling Co. against the Rust Boiler Co. Both decisions were favorable to the Rust Boiler Co., the court holding that there had been no infringement on either patent and dismissed both suits.

Generated on 2024-08-30 18:02 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

BOILER OF THE CAYUGA.

The photograph published herewith shows the lowering of the last boiler into the new steamer Cayuga building



LOWERING THE LAST BOILER INTO THE CAYUGA.

at the yard of the Canadian Ship Building Co., for the Niagara Navigation Co., Toronto. The boiler weighs thirty tons.

MARINE ENGINEERING INSTRUCTION AT ANNAPOLIS.

Midshipmen at the United States Naval Academy at Annapolis are about the hardest working students to be found anywhere. Every day something is added to the list of things they must know. They must be the most skilled engineers as well as tacticians. In fact, so constantly is warship machinery improved and increased that it is hard work for the naval officer to keep up with it. With the number of midshipmen jumping from the average of 300 to 830, and every prospect of nearly a thousand next June, more room and greater facilities were required for mechanical instruction at Annapolis. Accordingly, a big slice of the $10,000,000 appropriation by congress for the enlargement and equipment of the Naval Academy has been spent on the new marine engineering and naval construction building—a huge structure, 266 by 175 feet in size. It is two stories high, and cost $400,000 before a dollar had been spent for interior equipment.

On the ground floor is the model room, crammed with working models and exhibits of the thousand and one pieces of the machinery with which the naval officer must be as familiar as he is with guns and torpedoes. Adjoining the model room is the mechanical laboratory. Here is the full-sized working installation of the "Long-Arm" system of power doors, operating from a central station which, on a warship, is located above deck. When the officer in command releases a wheel he starts the door motors going, and the bulkhead doors are closed throughout the ship, rendering it unsinkable. At the same time the men below have the power to hold up any door temporarily for their own safety.

This is a fair example of the value of the marine engineering department in familiarizing midshipmen with the machinery of which they will later be in charge. All the new cruisers of the Colorado type, and the new battleships of the Connecticut class are equipped with this electrical door-closing system. It is a device which has been developed in the American navy only, and the working exhibit received interested and enthusiastic attention from Prince Louis of Battenburg when he visited the academy early in the winter.

In the mechanical laboratory, the midshipmen are instructed in classes of 275 some part of each day. A squad of midshipmen may be employed in the machine shop with automatic tools while another party is in the woodworking department, making patterns for machines. One company of the first class is engaged in molding, both in iron and brass, and on Saturday the brass furnace is put into operation and the midshipmen cast from molds, they have made during the earlier part of the week. The naval officer of the future in this way acquires practical knowledge of the construction of the ships he will later command.

MERCHANT MARINE LEAGUE.

After the annual meeting of the National Metal Trades Association held in Cleveland last week the following resolution in favor of governmental aid to shipping in the foreign trade was adopted:

Resolved, That the National Metal Trades Association, in annual convention assembled, hereby gives its most emphatic indorsement and approval of United States senate bill No. 529, known as the Gallinger bill for the aid of the American merchant marine, and this convention recommends and strongly urges upon the house of representatives the passage of this bill.

And, Further, That the secretary of this convention is hereby directed to transmit a copy of this resolution to the chairman of the committee on merchant marine and fisheries of the house.

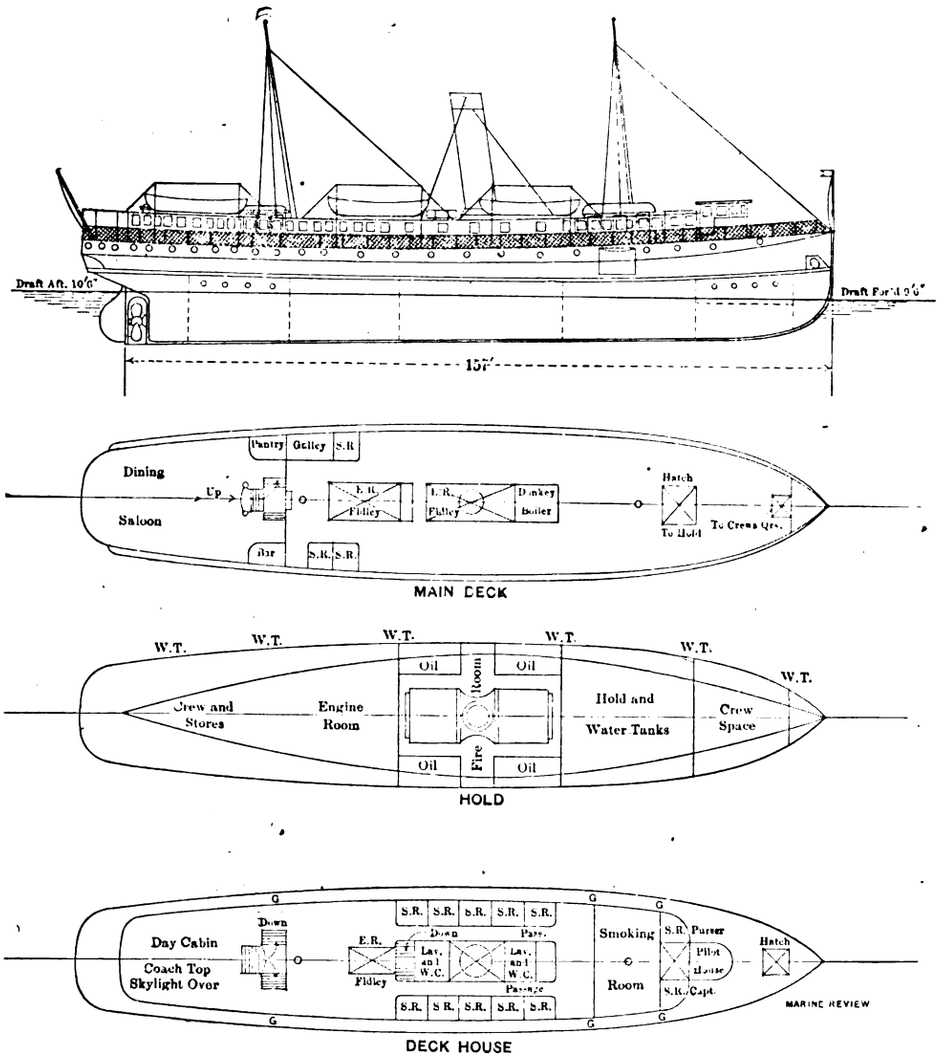
The house committee on merchant marine did not take up the shipping bill on March 22 as was expected, but postponed the hearing until April 4. There is assurance, however, that the bill will not be pigeon-holed by the committee, but will be reported by it to the house in due season. Complications, inseparable from legislation where politics is concerned, have made the house seemingly indifferent to the senate's bill. However, as soon as the rate legislation is out of the way, the shipping bill will be put upon the calendar. It is hoped that representatives of the manufacturing, commercial and financial interests of the country will be on hand at Washington when the bill comes up in committee on April 4.

Roach's Ship Yard, Chester, Pa., is an especially busy place at present. It is expected that the turbine steamer building for the Eastern Steamship Co. will be launched early in May. The Pequonnock, the freighter building for Long Island sound service which was recently launched, is rapidly being completed. Work is progressing favorably on the turbine steamers for the Metropolitan Steamship Co. and also on the steamer for the Ocean Steamship Co. of Savannah.

Generated on 2024-08-30 17:55 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

PASSENGER STEAMER FOR PUGET SOUND.

Moran Bros. Co., Seattle, Wash., recently completed a steel passenger steamer for the Puget Sound Navigation Co., the particulars of which are contained in the accompanying sketch. The steamer is 157 ft. long, 28 ft. beam on the water line, 33 ft. beam molded, 13 ft. deep and 10 ft. 6 in. draught. Her displacement is 650 tons. She has fifty staterooms and accommodations for 500 passengers. The engine is triple-expansion with cylinders 16, 26 and 43 in. diameters by 24-in. stroke. Steam is supplied by two Scotch boilers 11 ft. 9 in. diameter and 11 ft. long. Her horsepower is 1,000 and she is designed for a speed of 14 knots an hour.



PROFILE AND DECK PLAN OF PUGET SOUND STEAMER.

BATTLESHIP NEW JERSEY'S ENDURANCE RUN.

The performance of the battleship New Jersey in maintaining a speed of 19.18 knots an hour in a four-hour endurance run off the New England coast, coupled with her remarkable spurt yesterday over a measured mile at Rockland, Me., at a 19.48 knots an hour gait, places this product of the Fore River Ship Building Co. at the head of all American-built battleships, so far as speed is concerned. It was ascertained on her standardization trial off Rockland that an average revolution of her propellers of 125.53 per minute was sufficient to drive the 15,000-ton battleship through the water at her contract speed of 19 knots an hour. Today her average revolutions per minute reached 126.297 and from these figures the trial board announced that she had made an average of 19.18 knots an hour, compared with 19.01 made by the Rhode Island and 19.00 by the Virginia, sister ships, at their trials a few months ago. At one time today the New Jersey's speed reached 19.278 knots an hour for a period of 15 minutes, while her lowest for a similar period was 18.960. The New Jersey will now go back to the yards to finish her equipment and it is expected that she will go into commission in May.

CONCERNING SUBMARINES.

Submarines can be divided into two classes—namely, those which are worked by a crew, and must of necessity be capable of floating on the surface of the water so that the crew may have a means of ingress or egress, and those which carry no crew, such as every form of torpedo. The files at the patent office show that many inventors have given great attention to the problem of submarine navigation. The first thing which the designer has to arrange in a satisfactory fashion is to sink the boat to a depth at which it is desired to navigate. Now the weight of the vessel is equal to the weight of the water which is displaced by that vessel so that when a ship is floating on the surface, it is easy to see that the volume of the water displaced is less than the volume of the ship. It is possible to force her below by increasing her weight, or the weight of the boat may be constant but the volume may be lessened by drawing-in pistons in cylinders. This latter method was used by an inventor who built a submarine during the siege of Paris and it was discovered that as the pistons were drawn in the boat sank but the trials were not satisfactory probably because the power absorbed in pushing the pistons out, in order to make the vessel rise was very great. A submarine was tested in Tilbury docks about twenty-five years ago, and she depended for submersion upon ten pistons worked in this fashion. The trials were very discouraging, and some eminent men very nearly lost their lives, owing to the erratic behavior of the craft. Sir William White was in the boat at the time, and he probably has vivid recollections of the trials to this day. No designer thinks of adopting this method of submersion at the present time, and the way in which the little vessels of the British navy are lowered is by the admission of water into special tanks.

A HUGE STEEL INGOT.

The largest steel ingot yet produced was cast last

Generated on 2024-08-30 17:55 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

month at the Manchester works of Messrs. Armstrong, Whitworth & Co. It weighs 120 tons, and was made in accordance with the Whitworth fluid pressure system, the molten metal being poured into a mold itself weighing about 180 tons, which was then placed beneath a hydraulic press having a 6-foot diameter ram working at a pressure of 3 tons per square inch. The ingot is intended for the turbines of the new Cunard liner, which will develop 70,000 H. P.

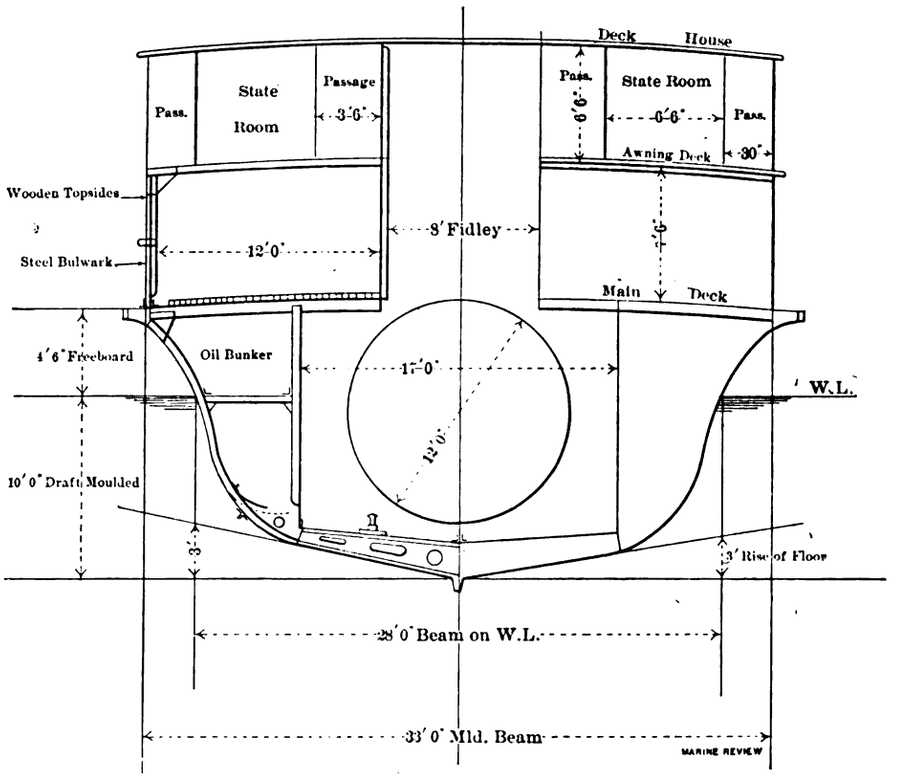
AN IMPROVED CONDENSER.

The C. H. Wheeler Mfg. Co., Philadelphia, are manufacturers of a condenser designed for maintaining a high vacuum. The condenser is of the series parallel type in which the steam enters the top group of tubes, passes by means of one header into the middle group and thence through the other header into the lower section and finally out. By this arrangement the hottest steam comes into contact with surfaces cooled by the coldest water, and in turn permits of the condensed steam or feed water being discharged from the air pump at the highest temperature possible, or within a few degrees of temperature corresponding with the tension of steam due to the vacuum in the condenser and discharging at the top of the opposite chamber, this arrangement keeping the condenser filled with cooling water at all times. The condenser is fitted with a Mullan crank and fly wheel suction valveless air pump. One of these sets was recently installed on the ferry Edgewater in New York harbor, displacing an ordinary surface condenser mounted with the old type of combined air and circulating pump. The old equipment had been in use for about three years and gave a vacuum ranging under different conditions from 18 to 24 in. of mercury. The new equipment is said to have furnished a vacuum of from 27 to 28½ in. with a corresponding reduction in fuel consumption of nearly 40 per cent.

POPULARITY OF ALMY WATER-TUBE BOILER.

The Almy Water Tube Boiler Co., Providence, R. I., has just issued the tenth edition of its catalog, describing and illustrating the design and merits of the Almy water-tube boiler. The catalog embraces a complete description of the boiler, together with line illustrations and photographs. Data is also given of evaporative tests of the boiler. There is included in the catalog the list of vessels that have been equipped with this form of boiler since 1889. It is interesting to note that the list has grown annually and that during the present winter of 1906 fourteen craft of various kinds have been fitted with this type of boiler. The catalog concludes with illustrations of hundreds of craft now afloat that have this type of boiler.

Congressman Humphrey, member of the congressional merchant marine commission, has an interesting article in the March number of the *North American Review* on "The Pending Shipping Legislation."



MIDSHIP SECTION OF PUGET SOUND STEAMER.

SAULT LANDS DEEDED TO GOVERNMENT.

The Chandler-Dunbar Power Co. has deeded to the government all of the land adjoining the ship canal at Sault Ste. Marie required for the widening of the approach to the locks from the west and for the construction of a third lock to the north of the Poe lock. This action makes possible the beginning at once of work upon widening the approach to the locks and releases an appropriation of $1,300,000, already available, but which had been tied up in litigation. Supt. Joseph Ripley of the canal hopes to begin work not later than August. The approach to the canal will be widened 108 ft., making it 208 ft. in width. President Livingstone of the Lake Carriers' Association and Mr. Harvey D. Goulder, its counsel, have gone to Washington to see that the conditions of the transfer are in proper form. The land deed by the Chandler-Dunbar Co. embraces a strip about 3,000 ft. long and from 100 to 200 ft. wide, containing 8.75 acres. It is estimated that the cost of widening the canal will be between $800,000 and $900,000 and that the construction of the head gate and movable dam will cost about $300,000 more. The work will probably take about two years, Supt. Ripley figuring to complete it by July, 1908.

The Lozier Motor Co. have been exhibiting at their show rooms at Fifty-fifth street and Broadway, New York, a very handsome trophy in the form of a large silver cup which will be competed for in the Argentine Republic. Great interest has been created in motor boat racing in Argentine in the past eighteen months, and the trophy—which will be known as the Lozier challenge cup—is presented to the Argentine Yacht Club jointly by the Lozier Motor Co. and their Buenos Ayres representatives. The cup is 21 in. in height and is engraved with panels representing a high-powered automobile racing boat at full speed. The competition for the Lozier cup is an annual one, all motor boats under 28 ft. in length being eligible under special rules of the club.

Generated on 2024-08-30 17:57 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

WHAT EVERY MASTER SHOULD KNOW.

The Application of the Variation and Deviation to the True Course—How to Separate the Var. and Dev. From the Compass Bearing, Etc.

BY CLARENCE E. LONG.

The MARINE REVIEW has no sympathy with mechanical processes—those operations requiring no thought—which are simply committed to memory, any more than it has with rules and formulas learned Poll-parrot fashion; and to navigate a ship by such method, is indeed, to tempt Providence. The navigator, to be a navigator, should have the principle of each problem which engages his attention, thoroughly learned; so that, relying upon the accuracy of his reasoning rather than on the distinctness of his memory, he may be able to solve it whenever called upon.

The navigator, of all men, should cultivate his reasoning powers to the fullest extent, for the safety of life and property depends upon the soundness of his judgment at critical times.

Possessing the requisite mental activity, and the power of selecting the most advantageous means out of the many at his disposal, is what constitutes the real test of a man's ability as a navigator and shows that his knowledge is not superficial, but based upon strictly sound principles, which cannot mislead. The navigator who intends to reach the "high ratline" of his profession must work hard for it, and his course must be, "The best that I can do is the poorest that I will do." No man need despair even though not specially gifted, either with intellect or education, if otherwise made of the right stuff—"grit." The race is not always to the swift, as exemplified in the fable of the hare and the tortoise. It is simply astonishing what dogged perseverance will accomplish, to which any self-taught man can readily attest.

"Rules of Thumb," when founded upon correct reasoning, are invaluable; but, on the contrary, "Rules of Thumb" not founded upon correct reasoning are a positive bane to the practical man, for whose benefit they are generally intended.

The navigation on the great lakes and sea coasts, with but a few exceptions, is performed by rules of thumb based upon incorrect reasoning. This navigation is too much on the mechanical-process-order, or navigation of the two-foot-rule kind. These navigators do certain things, but they are entirely ignorant of the principles involved; or in other words, they are unacquainted with the "whys" and "wherefores" of the methods they practice.

This is noticeable in more ways than one. The majority of lake captains pay no attention, whatever, to the variation of the compass existing between the place started from and the place, or turning-point sailed for; that is, they do not make the true or proper allowance for it in shaping the course to be steered. True, they allow for it in a way, but it is not done intelligently because they lack the knowledge of its governing laws and principles. In other words, they are ignorant of the first correction of the compass. In shaping a course between certain places or points on the lakes the master is guided mostly, if not wholly, by the course or courses steered over the same ground some previous time. Of course, in this way it is possible for them to make good courses. Others again, compare pier and river ranges, which happen to coincide, or nearly so, with certain lake courses, and in this manner courses are made, but no attention is paid either to the variation or to the deviation of the compass. They may not make a good course of it the first time, but in correcting the trial course steered for the second time by porting or starboarding the proper amount to this trial course, good "hits" are made; and in this way Var. and Dev. do not enter into the problem so far as the master is concerned. But, nevertheless, it plays its part, for what is the result when it is desired to steer a course to some place outside of the regular routes of the lakes, with no ranges or other marks by which to guide the course? The master then notes a course that he has already steered which coincides with, or is nearest to the one on the chart he wishes to follow. If the course he has picked out does not coincide with the one on the chart, but is near to it, say half a point, it is altered accordingly so as to allow for the difference in the angle made by the two courses. When the course is run and the vessel fetches wrong the blame is not laid to its proper cause because it is not known. In most instances, it is laid to leeway or current, Var. or Dev. having, it is supposed, nothing to do with it whatever.

Now, it is just as likely to happen that the variation existing for the first course found is of an opposite name to the variation existing for the second course, notwithstanding that the second course is determined from the first course. That is to say, if the variation in one case was easterly it would be westerly in the other, or vice versa.

To illustrate this we will take a practical example: From Sault canal on ranges (over stern) the true bearing or direction is W by S ¼ S (WSW ¾ W). Var. for this position about 2½° Wly. (equals ¼-pt. nearly); making the correct magnetic bearing of the range W by S (Var. Wly. allow to the right of the true course or bearing, to get correct magnetic course or bearing); that is to say, were the compass absolutely correct (free from Dev.) when the vessel headed in this direction (ranges directly over stern) and no other magnetic attraction other than the earth's, which gives the compass needle its directive force or pointing power, the compass would read W by S.

From a position 5 miles north of Eagle Harbor to Devil's island the true course is W by S ¼ S (WSW) ¾ W), same as Sault canal ranges; Var. at Eagle Harbor about 2½° Ely. and at Devil's island about 6° Ely., the mean of which is 4¼°, equal to ⅜-pt., making the correct magnetic course W by S ⅝ S (WSW ⅜ W)—Ely. Var. allow to the left of true course or bearing, to get correct magnetic course or bearing. Here we have the true directions precisely the same, but when the Var. is applied to make correct magnetic directions (that is, the application of the Var. to the true course) of them they differ by ⅝-point, or 7°; nevertheless, in either case, the vessel is heading true W by S ¼ S.

The uninformed master entertains the idea that because this range and course are one and the same true directions that whatever the compass reads when his boat is on with the range, represents the course to be steered by that particular compass from Eagle harbor to Devil's island. These true directions are nevertheless the same, but it is the change in the name of the Var. that accounts for it, the Dev. taking no part in the problem, because it remains the same for that heading of the vessel whether in the Sault river or on Lake Superior, providing, however, that the change of latitude is not too great. Where the name and change of the Var. is of the same name and amount, this practice is sufficiently accurate for all practical purposes; in fact, it is used a great deal and with good results, but it will not work on the same principle all over the lakes for the reason that the Var. is not of the same amount and name.

To render this the more comprehensive we will go on with the sample example: Supposing that when the vessel was on with this range the compass read W ½ S, instead

Generated on 2024-08-30 17:59 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

of W by S, which it would were it correct (free from Dev.) This then, to the uninformed man would be the course (W ½ S) to steer between Eagle harbor and Devil's islands, which he bases upon the theory already stated. But not so with the master educated in navigation. He would view it from an altogether different standpoint, and reason it in an entirely different way, because he would possess the proper knowledge upon which the principle is based. The first thing that he would do would be to determine the correct amount of the Var. (which he gets from the chart) and apply it to the true bearing of the range to get the correct magnetic bearing. As the Var. in this case is about ¼-pt. Wly., which applied to the true bearing W by S ¼ S gives the correct magnetic bearing W by S, as already stated. Now, if the compass is correct (free from Dev.) he knows beforehand that when his boat is on with this range the compass will have to show or point out the correct magnetic bearing of the range (W by S), and if it does not the difference between what he knows the correct magnetic bearing to be and what the compass says is the Dev. of the compass for that particular point of the horizon to which the vessel's head was directed. In this case the Dev. will be ½-pt. Wly. and as the Var. is ¼-pt. Wly.—the two added together equals ¾-pt. Wly. correction, which likewise represents the difference between the true bearing W by S ¼ S and the compass bearing W ½ S. Thus, the skilled navigator analyzes the various portions of each problem that engages his attention, separating the different parts comprising the "total" compass correction—the Var. from the Dev.—and giving each its proper value, and in each instance applying the right kind of remedy.

With the above data in his possession the well-informed navigator in shaping the course to be steered from Eagle harbor to Devil's island, will first ascertain the true course, which in this case is W by S ¼ S; then he ascertains the Var. for the course and position. This he would find to be ⅜-pt. Ely.—the opposite name of the Var. found for the Sault river range. This would make the correct magnetic course W by S ⅝ S, and the ½-pt. Wly. Dev. would give a compass course of W by S ⅛ S—a difference of ⅝-pt. with the direction or compass course obtained while on with the range, which was W ½ S.

Were this course steered on Lake Huron, where the Var. is practically the same amount and name as in the Sault river, then a good course of it would be made.

You will hear captains say that their compasses work good on Lakes Michigan and Huron, but not on Lakes Superior and Erie; meaning that the compass is not "off" as much on one lake as on another. This is because the Var. is jumbled up with the Dev. and vice versa; as the compass works the same on one lake as it does on another, providing that the Var. is accurately allowed for in each and every case. Sometimes the Var. is Ely. and sometimes Wly.; likewise the Dev., which is Ely. in one case and Wly. in another. When the Var. and the Dev. are of the same name it makes the compass appear to be more "off" than when the Var. and Dev. are unlike in name, that is, in relation to the true course, for one correction counteracts the other.

Here is the way this occurs. Supposing on an N by E course the Dev. is ¼-pt. Wly. True course from Chicago to Pt. Betsey N by E ½ E. Var. ¼-pt. Ely. Var. and Dev. being equal and opposite in name or direction, counteracts each other, and leaves the compass course the same as the true course, viz.: N by E ½ E. The captain is well satisfied with this as his "compass steers a chart course." The compass, nevertheless, has a Dev. of ¼-pt. on this course for the correct magnetic course from Chicago to Pt. Betsey is N by E ¼ E. To steer N by E true on Lake Huron, where the Var. is Wly. with this compass, he would have to steer N by E ½ E; but if it was desired to steer N by E ½ E true, as in the case on Lake Michigan the course to be steered by compass would be NNE.

In the same example supposing the Dev. on N by E was ¼-pt. Ely. instead of Wly., the compass course from Chicago to Pt. Betsey would then be N by E instead of N by E ½ E. In a case of this kind the captain would say that "the compass is off ½-pt;" whereas it is only a quarter point.

Supposing that a particular compass had ½-pt. Ely. Dev. on a SW course, and it was desired to steer a true SW course at the head of Lake Superior where the Var. is ¾-pt. Ely. The correct magnetic course in this case would be SW ¾ S, and the compass course (½-pt. Ely. Dev.) SW by S ¼ S. In this case the difference between this and the compass course is 1¼ points, which the unwary navigator would call the "deviation of the compass" or the "variation of the compass." The Var. and Dev. in this case, being of the same name, makes the "total" correction 1¼ points, but the Var. alone is ¾-pt. and the Dev. ½-pt.

Were it desired to steer SW true, by the same compass, at the easterly end of Lake Erie, in the vicinity of Buffalo, where the Var. is approximately ½-pt. Wly., the compass course would likewise remain the same as the true course, viz.: SW. In this case the Var. and the Dev. are of the same amount, but of opposite names, therefore, one correction counteracts the other. Here, the master ignorant of the rudiments of navigation would say that his compass was true because he was able to steer a true or chart course. Thus, even the novice in navigation, can see why the compass is way "off" in one case and "true" in another; notwithstanding that the deviation remains the same in both cases.

Here is another great error that the average master readily falls into. Coming out of a pier or while on with a range, he notes the course by compass, and then looks on the chart or in the lighthouse book, for the bearing. Then the difference between what the compass reads and what the lighthouse book says is what the compass is "off." The chart and lighthouse book give only the true bearing, the variation having to be applied by the master. Whatever he finds the compass to be "off" for that certain course is the "error," and whenever he has occasion to steer this course again allows for this difference, no matter what the amount and the name of the variation may be. Should it happen that the Var. for the course is of the same name as for the position found, the course steered will be correct, but if the Var. be different, and it usually is, the course steered will be wrong, and the captain will lay it to every cause, but the right one.

The average lake captain imagines that because his compass is adjusted that he ought to be able to steer a true or chart course without so much as even allowing for the magnetic variation existing between the point of departure and the point of destination. The primary object in adjusting compasses is to reduce large deviations to a minimum, to bring them within manageable limits, thus equalizing the directive forces, preventing sluggishness and to cause more readiness of movement of the compass card needle. With a large deviation the directive force on the compass needle is proportionally diminished with the vessel's head on some points, while with a corrected compass the directive force is nearly equalized on all points.

Perfection in compass adjusting is seldom attainable, owing to numerous causes, so that it becomes as neces-

Generated on 2024-08-30 17:56 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

sary to swing the vessel for a deviation card after the compass has been adjusted as before. In shaping a course the remaining deviation, if any, together with the variation, must be taken into account and applied to the true course to obtain its corresponding compass course.

The variation of the compass cannot be adjusted for because it varies in amount and changes name or direction, on different lakes; so that if it were adjusted for one place it would not answer in another.

There are many captains who seem to think that the variation is so small that it is not necessary to make any allowance for it. To show the absurdity of this it is only necessary to say that if the small variation existing between Chicago and Pt. Betsey (a ¼-pt.) was not taken into account the vessel would be 10 miles out of her way at the end of the run.

THE LENNOX ROTARY BEVEL SHEAR.

The accompanying illustrations show the Lennox rotary bevel shear as made by Joseph T. Ryerson & Son, Chicago. This tool has found a wide application in ship building yards, and does work which it is difficult to de-

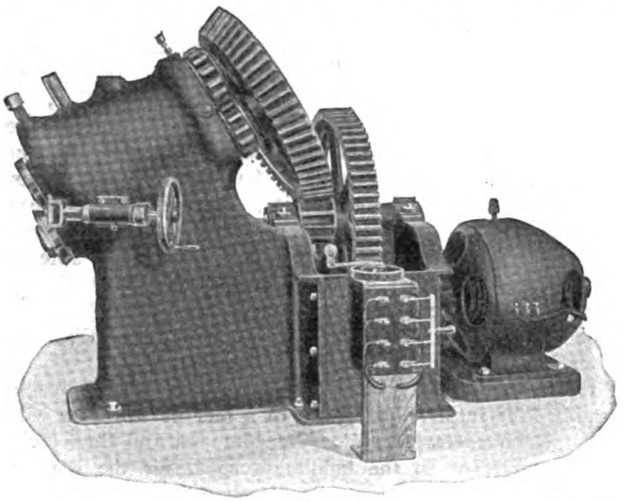


FIG. 1.

tect from a planed edge. It may be used for beveling the edges of domes after flanging, for beveling angles, for beveling in and out curves of a segment, or for beveling any irregular curved sheet.

Fig. 1 shows the machine as aranged for motor drive. Fig. 2 illustrates the tool in action, beveling the flange of a dome. The capacity of the tool is beveling steel of any thicknesses from ⅛ to ¾ of an inch. The work is done by circular blades which rotate in opposite directions, holding and feeding the plate while they cut it. The blades are made from tool steel, and are carefully turned and milled. The upper blade has a double edge, and in case of damage to one cutting edge, the blade may be easily reversed. The machine is so arranged that it will not receive a plate which is too thick, nor will it permit of a prying off strain. It is made in two sizes, No. 1 beveling up to ½-inch steel and weighing 3,500 lbs., and No. 2 beveling up to ¾-in. steel and weighing 5,000 lbs. The two shafts of the machine are arranged parallel, which insures a proper distribution of the cutting strains.

HIGH TEST OIL REQUIRED.

News has just been received in San Francisco of a decision very recently rendered by Captain Ira Harris, supervising inspector of steam vessels for the second district of New York, in reference to the use of lighting oil on vessels.

Some 20 years ago a law was passed requiring that lighting oil used on steam vessels should stand a 300-degree Fahrenheit test. About a year ago the law was extended to cover sailing vessels carrying passengers.

Captain Harris has decided that the law shall apply also to steam yachts. It does not refer to boats propelled by gasoline or other distillates. When there was an explosion of fuel oil gases on board the steamer Dispatch in the harbor of San Francisco a few months ago, a test was made of her lighting oil, and it was found that it would flash at 150 degrees.

An order was sent out that the law in this regard must be rigidly obeyed, and so far as is known all the vessels sailing from San Francisco, or plying on the bay that are required to do so are using the 300-degree oil. Kerosene is used to some extent, but much of it is sperm oil.

DETROIT WATER-TUBE BOILER.

The East End Boiler Works, Detroit, Mich., has recently made the following installations of Detroit water-tube boilers: two 125 H. P. in the Grand opera house, Chicago, Ills., for 160 lbs. steam; three 150 H. P. in the New Brevoort hotel, Chicago, Ills., for 160 lbs. steam; three 185 H. P. in the New Borland building, Chicago, Ills., for 160 lbs. steam; one 75 H. P. in dredge built by the Jas. L. Taylor Dredge & Mfg. Co., Royal Centre, Ind., for 150 lbs. steam; one 100 H. P. shipped to Nicaragua, South America, for 200 lbs. steam; one 210 H. P. shipped to Messrs. Swallow & Hopkins, Lake City, Fla., for 300 lbs. steam working pressure. The company is now constructing one 110 H. P. marine boiler for the steam yacht Pastime owned by H. Walker & Sons, Walkerville, Ont.

The Engineering Record describes a trolley boat which has been in service during the winter in the intake canal of the Niagara Falls Power Co. for keeping the surface free from floating ice. The boat is 25 ft. in length by 10 ft. beam and is operated by a 75-kw. Westinghouse single-phase railway motor, current being delivered to the boat by double trolley wires suspended longitudinally over the canal with over-running trolley and flexible cable. The motor has rheostatic con-

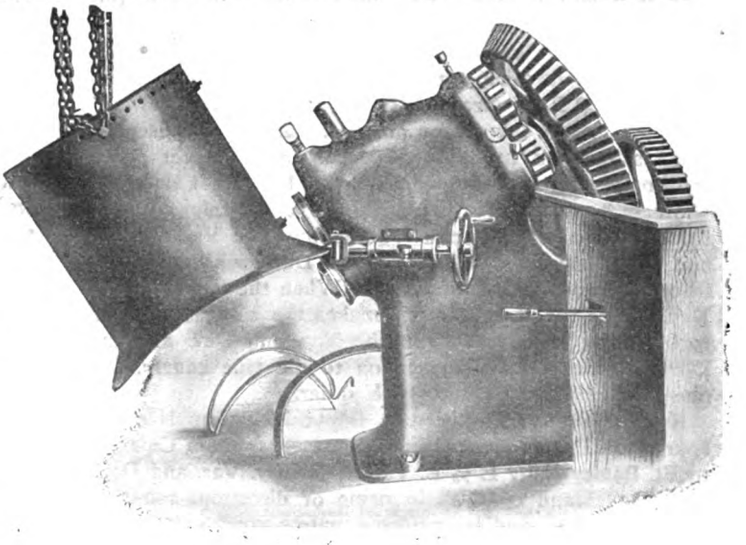


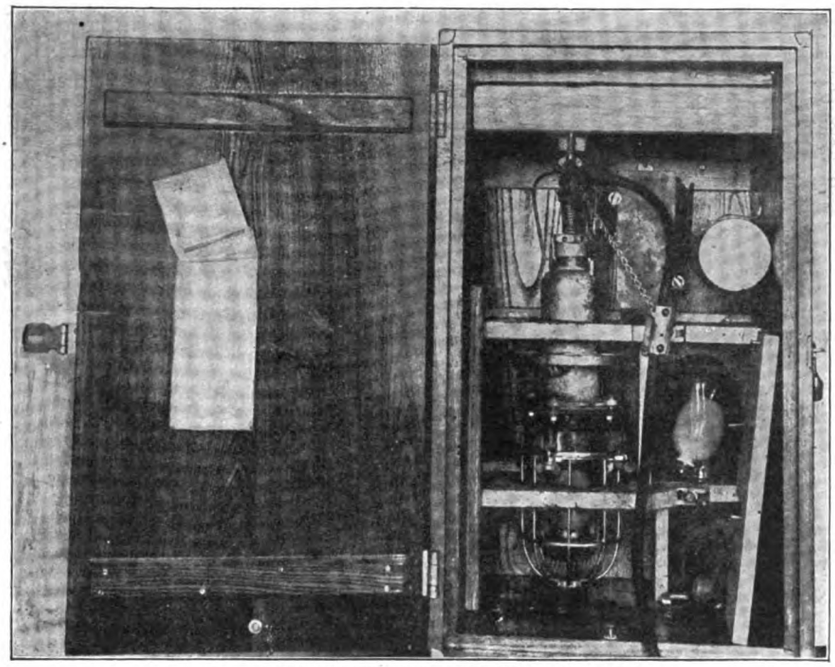
FIG. 2.

trol giving, if necessary, propeller speeds of 100 to 275 R. P. M.

Generated on 2024-08-30 17:57 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

YALE SUBMARINE LAMP.

The new Yale submarine lamp, made by the Electric Marine Mfg. Co., 95 Liberty street, New York, is sure to revolutionize the present methods of carrying on diving operations. The invention has passed the experimental stage having been in practical use for several years by the United States, British, Russian and Italian governments,



SHOWING COMPACTNESS OF YALE LAMP.

and the Merritt & Chapman Derrick & Wrecking Co. Work hitherto believed impossible under water has been accomplished with ease and certainty. In the shadow of a ships' hull, an obstruction, or at depths of 50 ft. or over, there exists an impenetrable gloom even with fairly clear water, while in the usual dirty harbor the sun's rays never reach the bottom. With the Yale submarine electric lamp one need never fear about going down into a black hole where imaginary horrors abound. The yachtsman in search of recreation, or the professional diver, may go down to the bottom and explore or work in perfect ease, for the light from this lamp lights up a space the size of a large room as bright as day.

An outfit for general use shown in one of the illustrations gives an idea of its compactness when stowed in chest ready for shipment or instant service. The lamp, submarine cable, switch, connection box, wrenches, spare parts and supplies, are all included in one chest. The Yale submarine electric lamp consists of a water-tight metallic case including a mechanism and regulator arranged so that when the lamp is submerged it will give forth from the glass chamber at its lower end, a most brilliant, clear light, better than the best average street arc lamp. When in use the diver may carry the lamp by means of the circular guard-handle, set it down, or suspend it in a convenient manner directly by the cable, no ropes being required. Its weight under water is only a few pounds—just enough to keep in position in a current or tideway.

The submarine cable conducting the current of the lamp, leads to the surface and thence to a combined junction and switch plate controlled by the diver's attendent. From this plate connection is made to a neighboring electric circuit, storage battery, or small generator outfit supplying the electric power. Compact, of few parts and simple in operation, these submarine outfits afford means for use aboard ship, about a dockyard, mine, waterworks, engineering construction, in short—wherever a perfect light for use under water or in a gaseous atmosphere is desired.

Exemplified in the naval battles of the eastern seas were the most modern and up-to-date vessels the world had ever seen, yet it was observed that one after another of the magnificent Russian warships, in spite of all their triumphs of modern equipment, were seen to sink beneath the surface of the Japanese waters. Fuller investigation has revealed the fact that these splendid ships began, almost from the commencement of the action, slowly, but steadily to sink, water entering holes made by "hull shots" of the Japanese gunners. Scarcely any of these shot holes were dangerous to the buoyancy of the vessel at the time they were made, but they kept everlasting at work letting water into their vitals until at length they became helpless.

Aside from the arrangement of water-tight bulk heads, various protections by cellulous and a few makeshift "stop leak" devices kept on board, there seems to have been no provision for maintaining the ship's buoyancy under constant fire.

At least one prominent naval power has seen the force of such argument and is bending every energy to alleviate the present imperfect conditions.

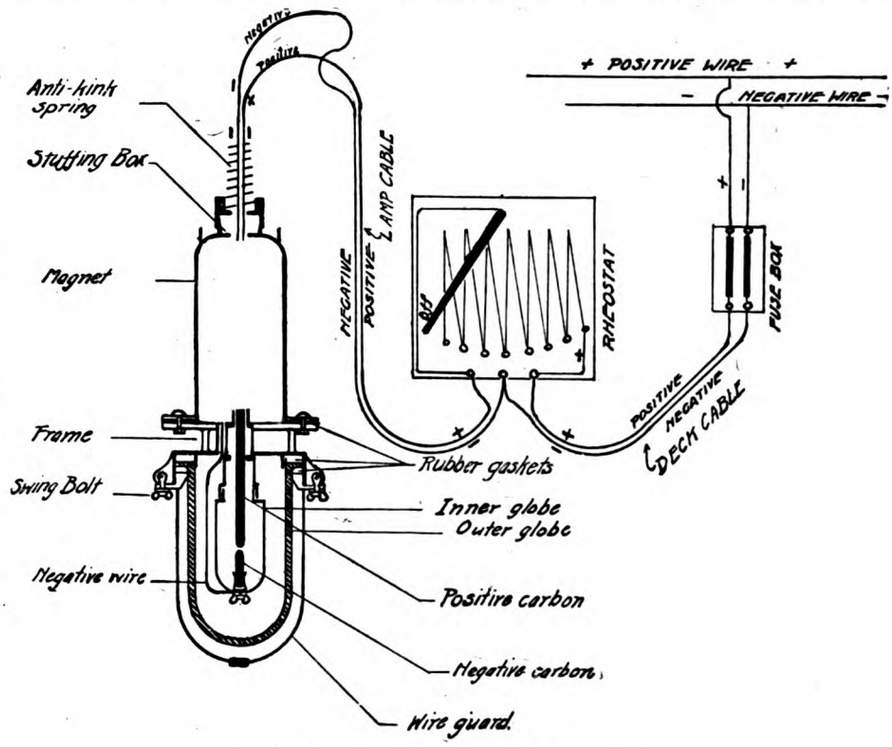
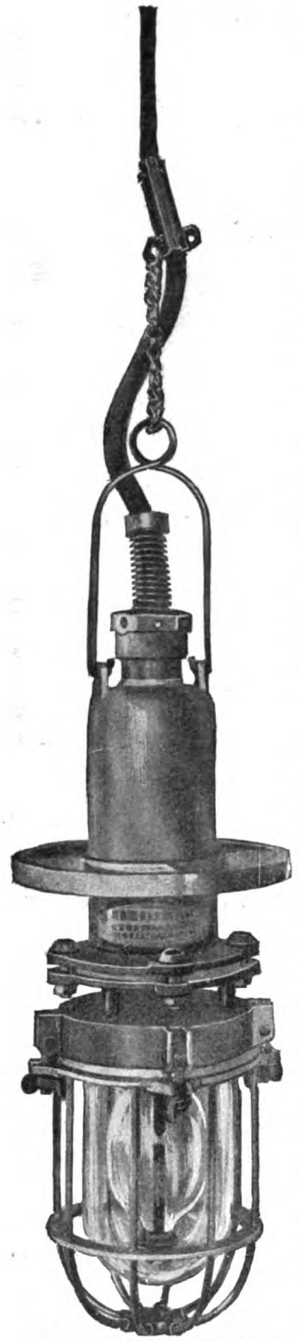


DIAGRAM OF CONNECTIONS OF YALE LAMP.

Generated on 2024-08-30 17:58 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

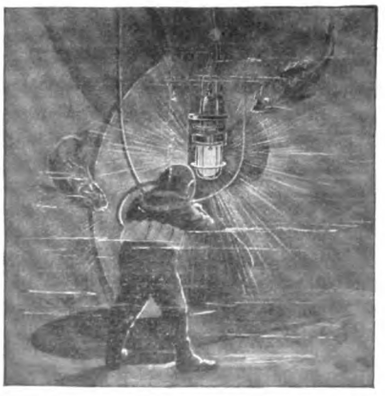


YALE SUBMARINE LAMP.

The solution of the difficulty involves largely submarine operations. Whatever means is taken to close a hole by shell or torpedo below the water line, repair a sea cock or propeller requires sooner or later a diver. Diving methods having seldom been resorted to, have remained practically the same as they were forty years ago. That is, when the diver gets a task to perform he gets inside his water-tight suit with air tubes attached, is sealed up in it and goes over board. When he gets down to where the defective part is supposed to be, he gropes around in the dark till he finds it, and then with the aid of a hammer, crowbar, chisel, or other crude hand tools, and usually by the sense of feeling alone, he starts to work. One can imagine that only the simplest makeshift repairs of doubtful permanence may be made under such conditions.

Therefore, in order to render the services of a diver of real value in making durable repairs, it was found necessary to considerably change the methods of operation and equipment. The question of light, the first step was solved by the use of the powerful Yale submarine electric lamp, by its inventor, Francis G. Hall, the problem of increasing the workman's efficiency was attained by Mr. Hall, by means of new submarine pneumatic tools, through the collaboration of the Chicago Pneumatic Tool Co.

The complete equipment is designed to be placed aboard a ship in its own chest ready for use. Every vessel and dockyard in the navies of the chief world powers, and many corporations carry a detail of divers more or less expert in the old fashioned methods. These men will be as regularly instructed in the manner of using the new equipment as are the gunners, torpedoists, or caisson men. Schools especially equipped with diving tanks have been already established, and the men trained have already done some remarkably difficult work in submarine patching, plate and machine work. Letters patents to protect the apparatus have been taken out here and abroad, of which the Electric Marine Mfg. Co. are the sole owners, and the Chicago Pneumatic Tool Co. will act as the selling agents of the Yale submarine electric lamps and appliances.



DIVER AT WORK WITH YALE LAMP.

By means of this invention it will be possible to make permanent repairs, outside as well as inside, the hull to a vessel even under fire. Further, it is predicted that a fleet in cruising trim may be kept fairly clean and in good repair during an extended cruise and without recourse to the dry dock. What this means can best be appreciated by Admiral Rojestvensky, who was obliged to make frequent costly delays on his long cruise to the far east, only to arrive with a squadron of battleships encrusted with marine growth and uncertain as to the seaworthiness of the hulls.

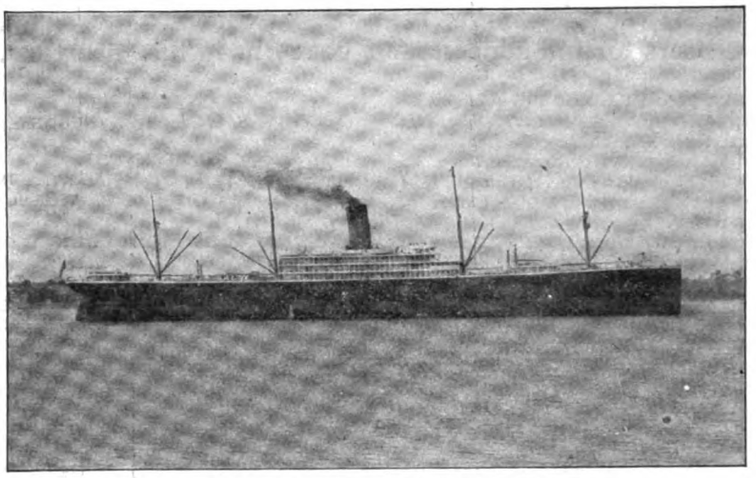
NEW GAS-DRIVEN BARGE.

An enterprise that must considerably help the industrial development of the country, as well as agriculture, is now being carried out by Messrs. Thornycroft & Co., in connection with the firm of canal-carriers, Messrs. Fellows, Clayton, & Morton. It is to dispatch the barge Duchess (71 ft. long by 7 ft. beam) on a 1,000-mile voyage through the canals in order to demonstrate the suitability and economy of suction gas machinery for propelling canal craft in place of steam and horsepower. There is reason to think that whichever government is returned to power, as a result of the election which is now proceeding, the subject of canal development in this country will receive a good deal of attention, and in view of this Messrs. Thornycroft's demonstration will be watched very closely by engineers, who are specially interested in the subject. The barge was formerly equipped with an ordinary steam engine and boiler, and it is interesting to know that the installation of the suction gas plant has enabled the engine room to be shortened by 3 ft. The engine stands 4 ft. high, and develops 30 H. P. at 300 revolutions. It is of the Capitaine-Thornycroft type, having two cylinders, 8¼ in. bore by 11 in. stroke low-tension magneto ignition being employed. In order to start the engine a small auxiliary petrol engine is employed, as it is necessary to get the main engine running at about 100 revolutions before it will start firing. The producer is cylindrical in shape, and stands about 5 ft. high, by 3 ft. in diameter. At the bottom is a grate on which anthracite coal is burned. A jet of steam is directed into a chamber beneath the grate, and a mixture of steam and air is drawn, by the suction of the engine, through the mass of incandescent coal. The chemical action thus set up results in the production of water gas (C_6H_4), carbon monoxide (CO), and free hydrogen (H_2). This mixture, known as producer gas, is first cooled and cleaned by jets of water, in a chamber called the "scrubber," and then passed into a "dryer," which consists practically of a pneumatic centrifugal pump, after which it is mixed with about one and a half times its volume of air, and is ready for use in the engine. The engine is connected to a Gaines' reversible propeller, which drives the boat loaded with ten and a half tons of cargo, and towing a butty carrying twenty-three tons, at about three or four miles per hour, a speed which favorably compares with ordinary steam propulsion.

The Paris agent of the Lozier Motor Co. has just received a special diploma from the king of Portugal, accompanied by a letter from the high secretary of the king, expressing that ruler's appreciation of the Lozier launch and engine which he has been using for several months past.

Generated on 2024-08-30 17:56 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Hyde Windlasses and Capstans



Steamship Minnesota equipped with Hyde Windlass and Capstans.

Selected for the Minnesota and Dakota of the Great Northern Steamship Co.'s fleet—the largest vessels ever built in the United States. They are also being installed on nearly all of the vessels now building for the Navy Department, Revenue Cutter service, Lighthouse Board and the United States Coast Survey.

Reason—Their Superiority

Send for Illustrated Catalog.

HYDE WINDLASS COMPANY

BATH, MAINE

Geo. L. McCurdy

169 Jackson Boulevard

CHICAGO ILLINOIS

INSURANCE

HULLS and CARGOES

DIRECT REPRESENTATIVE OF LEADING AMERICAN AND FOREIGN UNDERWRITERS

THE
BOURNE-FULLER CO.
IRON STEEL
PIG IRON
COKE
Cleveland, Ohio.

SAFETY AT SEA

in time of danger depends upon the closure of the ship's bulkhead doors. A long series of maritime disasters shows that this can only be accomplished by means of

THE "LONG-ARM" SYSTEM

By this system, consisting of a central emergency station from which power doors and hatch-plates are unfailingly controlled, the electric motor does the work, leaving nothing to chance or individual initiative and bravery. Adopted after searching tests for use on 36 vessels of the United States Navy. *Further information may be obtained from*

The "Long-Arm" System Co., Ceveland, O.

Generated on 2024-08-30 17:59 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Buyers' Directory of the Marine Trade

For a more complete classification than that represented by advertisers in the Marine Review, see the BLUE BOOK OF AMERICAN SHIPPING, marine and naval directory of the United States, published by The Marine Review, Cleveland.

See accompanying index of Advertisers for full addresses of concerns in this directory.

AIR COMPRESSORS, AIR HOISTS, ETC.
Great Lakes Engineering Works.....Detroit.
Mietz, Aug. .....New York.

AIR PORTS, DEAD LIGHTS, ETC.
Marine Mfg. & Supply Co.....New York.

AIR PUMPS AND APPLIANCES.
Fore River Ship & Engine Co..Quincy, Mass.
Great Lakes Engineering Works.....Detroit.

ANCHORS.
Bowers, L. M. & Co.....Binghamton, N. Y.

ANTI-FRICTION METALS.
Cramp, Wm. & Sons.....Philadelphia.

ARTIFICIAL DRAFT FOR BOILERS.
American Ship Building Co.....Cleveland.
Detroit Ship Building Co.....Detroit
Great Lakes Engineering Works.....Detroit

ASH EJECTORS.
Great Lakes Engineering Works.....Detroit.

ATTORNEYS AND PROCTORS IN ADMIRALTY.
Gilchrist, Albert J.....Cleveland.
Goulder, Holding & Masten.....Cleveland.
Hoyt, Dustin & Kelley.....Cleveland.
Jenkins, Russell & Eichelberger....Cleveland.
Kremer, C. E.....Chicago.
MacDonald, Ray G.....Chicago.
Shaw, Warren, Cady & Oakes.....Detroit.
White, Johnson, McCaslin & Cannon Cleveland

BAROMETERS, MARINE GLASSES, ETC.
Ritchie, E. S. & Sons.....Brookline, Mass.

BELTING (LEATHER).
Republic Belting & Supply Co.....Cleveland.

BLOCKS, SHEAVES, ETC.
Boston & Lockport Block Co.....Boston, Mass.
Cleveland Block Co.....Cleveland.

BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, David.....New York.
Marine Construction & D. D. Co.....
.....Mariner's Harbor, S. I., N. Y.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
Willard, Chas. P. & Co. Winthrop Harbor, Ill.

BOILER COMPOUNDS.
The Bird-Archer Co..... New York
Dearborn Drug & Chemical Works....Chicago.

BOILER MANUFACTURERS.
Almy Water Tube Boiler Co..Providence, R. I.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Chicago Ship Building Co.....Chicago.
Cramp, Wm. & Sons.....Philadelphia.
Dearing Water Tube Boiler Co.....Detroit.
Detroit Ship Building Co.....Detroit.
East End Boiler Works.....Detroit.
Fletcher, W. A. & Co.....Hoboken, N. J.
Fore River Shipbuilding Co....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Kingsford Foundry & Machine Works....
.....Oswego, N. Y.
Maryland Steel Co.....Sparrows Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.

BOILER MANUFACTURERS—Continued.
Mosher Water Tube Boiler Co....New York.
Newport News Ship Building Co.....
.....Newport News, Va.
New York Shipbuilding Co.....Camden, N. J.
Northwestern Steam Boiler & Mfg. Co....
.....Duluth, Minn.
Quintard Iron Works Co.....New York.
Roberts Safety Water Tube Boiler Co....
.....New York.
Superior Ship Building Co.....Superior, Wis.
Taylor Water Tube Boiler Co.....Detroit.

BOILER RIVETS.
Bourne-Fuller Co.....Cleveland.

BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co..Cuyahoga Falls, O.

BRASS AND BRONZE CASTINGS.
Cramp, Wm. & Sons.....Philadelphia.
Fore River Ship & Engine Co..Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Lunkenheimer Co.....Cincinnati.

BRIDGES, BUILDERS OF.
Scherzer Rolling Lift Bridge Co.....Chicago.

BUCKETS, ORE AND COAL.
Brown Hoisting & Conveying Machine Co.
..... Cleveland.

BULKHEAD DOORS, WATERTIGHT.
"Long Arm" System Co.....Cleveland.

CABIN AND CABINET FINISHING WOODS.
Martin-Barriss Co.....Cleveland.

CANVAS SPECIALTIES.
Baker & Co., H. H.....Buffalo.
Bunker, E. A. .....New York.
Upson-Walton Co.....Cleveland.
Republic Belting & Supply Co.....Cleveland.

CAPSTANS.
American Ship Windlass Co..Providence, R. I.
Dake Engine Co.....Grand Haven, Mich.
Hyde Windlass Co.....Bath, Me.
Marine Mfg. & Supply Co.....New York.

CEMENT, IRON FOR REPAIRING LEAKS.
Smooth-On Mfg. Co.....Jersey City, N. J.

CHAIN CONVEYORS, HOISTS.
Brown Hoisting Machinery Co. (Inc.)....
..... Cleveland.
General Electric Co.....Schenectady, N. Y.

CHAIN HOISTS.
Boston & Lockport Block Co....Boston, Mass.
Republic Belting & Supply Co.....Cleveland, O.

CHARTS.
Penton Publishing Co.....Cleveland.

CLOCKS (Marine and Ship's Bell) AND CHRONOMETERS.
Ritchie, E. S. & Sons.....Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.

COAL AND ORE HANDLING MACHINERY.
Brown Hoisting Machinery Co. (Inc.)....
..... Cleveland.

COMPASSES.
Ritchie, E. S. & Sons.....Brookline, Mass.

CONDENSERS.
Great Lakes Engineering Works.....Detroit.
Thropp & Sons Co., John E...Trenton, N. J.

CONTRACTORS FOR PUBLIC WORKS.
Breymann & Bros., G. H.....Toledo.
Buffalo Dredging Co.....Buffalo.
Dunbar & Sullivan Dredging Co.....Buffalo.
Fitz-Simons & Connell Co.....Chicago.
Great Lakes Dredge & Dock Co.....Chicago.
Hickler Bros.....Sault Ste. Marie, Mich.
Hubbell Co., H. W.....Saginaw, Mich
Lake Superior Contracting & Dredging Co.,
..... Duluth, Minn.
Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H..Milwaukee.
Sullivan, M.....Detroit.

CORDAGE.
Baker & Co., H. H.....Buffalo.
Upson-Walton Co.....Cleveland.

CORK JACKETS AND RINGS.
Armstrong Cork Co.....Pittsburg, Pa.
Kahnweiler's Sons, D.....New York.

CRANES, TRAVELING.
Brown Hoisting Machinery Co.....Cleveland.

DIVING APPARATUS.
Morse, A. J. & Son.....Boston.
Schrader's Son, Inc., A..... ... New York.

DREDGING CONTRACTORS.
Breymann & Bros., G. H.....Toledo.
Buffalo Dredging Co.....Buffalo.
Dunbar & Sullivan Dredging Co.....Buffalo.
Fitz-Simons & Connell Co.....Chicago.
Great Lakes Dredge & Dock Co.....Chicago.
Hickler Bros.....Sault Ste. Marie, Mich.
Hubbell Co., H. W.....Saginaw, Mich
Lake Superior Contracting & Dredging Co.
..... Duluth, Minn.
Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H..Milwaukee.
Sullivan, M.....Detroit.

DREDGING MACHINERY.
Quintard Iron Works Co.....New York.

DRY DOCKS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Ship Building Co.....Detroit.
Great Lakes Engineering Works.....Detroit.
Lockwood Mfg. Co.....East Boston, Mass.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co.....
.....Newport News, Va.
Shipowners Dry Dock Co.....Chicago.
Superior Ship Building Co....Superior, Wis.
Tietjen & Lang Dry Dock Co.....Hoboken, N. J

DREDGE BUILDERS.
Manitowoc Dry Dock Co.....Manitowoc, Wis.

DYNAMOS.
General Electric Co.....Schenectady, N. Y
Mietz, Aug.....New York.
Thropp & Sons, John E.....Trenton, N. J.

ELECTRIC HOISTS AND CRANES.
General Electric Co.....Schenectady, N. Y.

Generated on 2024-08-30 18:02 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

WANTED and FOR SALE Department.

PROPOSALS.

U. S. Engineer Office, Duluth, Minn., April 2. 1906. Sealed proposals for building a steel tug complete, will be received here until noon May 2, 1906, and then publicly opened. Information on application. CHAS. L. POTTER, Major, Engrs.

U. S. Engineer Office, Detroit, Mich., March 10, 1906 Sealed proposals for dredging Rouge River, Mich., will be received here until 3:00 P. M., April 10, 1906, and then publicly opened. Information furnished on application. CHARLES KELLER, Capt., Engrs.

FOR SALE.

Engine

FOR SALE: Vertical beam jet condensing engine; cylinder 40 inches, 8-foot stroke; built by Fletcher & Harrison; Stevenson front. Engine complete in every particular and in excellent condition. For further particulars apply to HOWARD S. FOLGER, Kingston, Ont., Canada.

For Sale.

Square fire box marine boiler. Built 1898, 8 ft. 6 in. wide, 13 ft. long. Allowed 130 lbs pressure. American inspection. For further particulars apply to F. E. HALL, Trenton, Ont., Can.

For Sale or Charter.

Fish tug Enterprise, built 1888, rebuilt 1904, 50 x 14 ft., engine 10½ x 12, boiler 52″ x 8 ft., 120 lb. steam pressure.

CHAS. DAHLKE,
208 American Trust Bldg.,
Cleveland, O.

FOR SALE.

FOR SALE.
Delivery Boat "I-No-U."

We want to sell our delivery boat because we have no further use for her.

She commenced service a new boat in the Spring of 1904. We built her by the day and of the best material we could buy. Cost $2,000. Hull 38½ ft. long, 8½ ft. beam. Frames 2″ x 3″ at bottom and 2″ x 2″ at top and spaced 12″ from center to center.

For a distance of eight feet alongside of engine there is an intermediate frame. Keel is 5¼″ x 10½″. Planking and ceiling 1⅛″ thick. All White Oak. Engine, 15 H. P. Lacy Single Cylinder Four Cycle. Turns a 34″ wheel 300 R. P. M. Speed 8½ miles per hour. Send for photo. We think she is the best built Delivery Boat on the lakes and believe you would be of the same opinion if you saw her. If you need a delivery boat buy a good one and avoid spending a lot of money every winter in repairs, etc.

Address
THE HARDY & DISCHINGER CO.,
Oils & Supplies,
Toledo, Ohio.

For Sale.

Steamer Columbia, length 115 ft., beam 21 ft. Steamer Crescent, length 80 ft., beam 16 ft. For further information apply to C. A. Webb, Traverse City, Mich.

FOR SALE.

A Bargain.

Steamer "Huntress," built in 1880, tonnage 114, length 110 ft., beam 18 ft., draft 7½ ft., carries 215 passengers. Hull and boiler in good condition. For sale at a bargain. Apply for information to SMITH, DAVIS & CO., 200 Main St., Buffalo, N. Y.

For Sale.

Five Scotch Boilers, allowed 160 lbs. steam. Good as new. ERIE MACHINERY CO., 729 Garfield Bldg., Cleveland, O.

A Bargain.

Steamer E. F. Gould, length 137 ft., width 28 ft, depth 8 ft. 5 in, tonnage 261 tons. Boiler, engine and hull in good condition. First-class, complete sand pumping outfit now installed on boat, will sell with boat if so desired. Apply

JOHN M. McKERCHEY,
Detroit, Mich.

WANTED

THAT'S OUR BUSINESS

Buying, Selling, Chartering BOATS.

If you desire to charter, sell or buy let us help you.

CHICAGO STEAMER EXCHANGE,
No. 2 Rush Street.
Long Distance 'Phone Cent. 5046. **CHICAGO.**

GREAT LAKES REGISTER

FOR THE
CLASSIFICATION OF STEEL AND WOODEN VESSELS.

Estb. 1828 — Estb. 1898

COMBINED AND ISSUED IN CONNECTION WITH

BUREAU VERITAS

INTERNATIONAL REGISTER OF SHIPPING.

THE RATINGS OF GREAT LAKES REGISTER GO BEFORE AND ARE ACCEPTED BY THE LEADING UNDERWRITERS OF AMERICA AND EUROPE. VESSELS BUILT UNDER THE SUPERVISION OF ITS SURVEYORS WILL RECEIVE SPECIAL RATING, AND WILL ALSO BE PUBLISHED IN BUREAU VERITAS INTERNATIONAL REGISTER OF SHIPPING.

PLANS AND SPECIFICATIONS FURNISHED.

GREAT LAKES REGISTER SURVEYORS ARE ESTABLISHED AT ALL THE PRINCIPAL PORTS ON THE GREAT LAKES.

F. D. HERRIMAN, SURVEYOR GENERAL,
320-322 Perry-Payne Building, · · · CLEVELAND, O.

CHARLES E. PECK. WILLIAM A. PRIME.

CHAS. E. & W. F. PECK,

Insurance Brokers. Average Adjusters.

ESTABLISHED 1870.

NEW YORK, 58 William Street,
BOSTON, 153 Milk St.
BUFFALO, 906 The Fidelity Bldg.
CLEVELAND, 1107-8 Williamson Bldg.
CHICAGO, 1115-16 Royal Insurance Bldg.

REPRESENTED BY
C. T. BOWRING & CO., (Insurance) LTD.,
5 and 6 Billiter Ave., LONDON,
and at "LLOYD'S" LONDON.

HULLS and CARGOES.

We place insurances in the most advantageous markets, employing, in the interest of our clients and with equal facility, all Foreign and Home companies, at the best procurable rates and terms.

We Represent Only the Assured.

The Blue Book of American Shipping,
Marine Directory of the World, $5.00

Practical Marine Engineering

By PROF. W. F. DURANT

For Marine Engineers and Students, with aids for applicants for marine engineers' license.

PRICE $6.00

FOR SALE BY
THE MARINE REVIEW, Cleveland

Generated on 2024-08-30 17:55 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Buyers' Directory of the Marine Trade.—*Continued.*

ELECTRIC LIGHT AND POWER PLANTS.
General Electric Co.....Schenectady, N. Y.
Mietz, Aug. .....New York.
Thropp & Sons, John E.....Trenton, N. J.

ENGINE BUILDERS, MARINE.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Ship Building Co.....Detroit.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Shipbuilding Co....Quincy, Mass.
Great Lakes Engineering Works.Detroit, Mich.
Hall Bros. .....Philadelphia.
Lockwood Mfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrows Point, Md.
Mietz, Aug.....New York.
Milwaukee Dry Dock Co.....Milwaukee.
Mosher, Chas. D.....New York.
Newport News Ship Building Co.....
.....Newport News, Va.
New York Shipbuilding Co....Camden, N. J.
Northwestern Steam Boiler & Mfg. Co...
..... Duluth, Mich.
Quintard Iron Works Co.....New York.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mfg. Co.....Milwaukee.
Superior Ship Building Co....Superior, Wis.
Thropp, J. E. & Sons Co.....Trenton, N. J.
Trout, H. G.....Buffalo.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.
Cory, Chas. & Son.....New York.
Marine Mfg. Supply Co.....New York.

ENGINEERING SPECIALTIES AND SUPPLIES.
Lunkenheimer Co. .....Cincinnati.
Northwestern Steam Boiler & Mfg. Co...
..... Duluth, Minn.

ENGINEERS, MARINE, MECHANICAL, CONSULTING.
Hynd, Alexander .....Cleveland.
Hunt, Robt. W. & Co.....Chicago.
Kidd, Joseph.....Duluth, Minn.
Mosher, Chas. D.....New York.
Nacey, James .....Cleveland.
Roelker, H. B. .....New York.
Wood, W. J. .....Chicago.

FEED WATER PURIFIERS AND HEATERS.
Greacen-Derby Engineering Co.....
.....Perth Amboy, N. J.
Ross Valve Co.....Troy, N. Y.

FIXTURES FOR LAMPS, OIL OR ELECTRIC.
General Electric Co.....Schenectady, N. Y.

FORGES.
Sutton Co., C. E.....Toledo, O.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.
Cleveland City Forge & Iron Co...Cleveland.
Fore River Shipbuilding Co.....Quincy, Mass.
Macbeth Iron Co.....Cleveland.

FLUE WELDING.
Fix's, S. Sons.....Cleveland.

FUELING COMPANIES AND COAL DEALERS.
Hanna, M. A. & Co.....Cleveland.
Ironville Dock & Coal Co.....Toledo, O.
Parker Bros. Co., Ltd.....Detroit.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Smith, Stanley B., & Co.....Detroit.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

GAS BUOYS.
Safety Car Heating & Lighting Co..New York.

GAS AND GASOLINE ENGINES.
Chase Machine Co.....Cleveland.

GAUGES, STEAM AND VACUUM.
Lunkenheimer Co. .....Cincinnati.

GAUGES, WATER.
Lunkenheimer Co. .....Cincinnati, O.

GENERATING SETS.
General Electric Co.....Schenectady, N. Y.

GRAPHITE.
Dixon Crucible Co., Joseph..Jersey City, N. J

GREASE EXTRACTORS.
Greacen-Derby Engineering Co.....
.....Perth Amboy, N. J.

HAMMERS, STEAM.
Chase Machine Co.....Cleveland.

HEATING APPARATUS.
Sutton Co., C. E.....Toledo, O.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting Machinery Co. (Inc.)....
..... Cleveland.
Chase Machine Co.....Cleveland.
Dake Engine Co.....Grand Haven, Mich.
General Electric Co.....New York.
Georgian Bay Engineering Works.....
.....Midland, Ont.
Hyde Windlass Co.....Bath, Me.
Marine Iron Co.....Bay City.
Mietz, Aug. .....New York.

HOLLOW SHAFTINGS, IRON OR STEEL.
Falls Hollow Staybolt Co...Cuyahoga Falls, O.

HOLLOW STAYBOLT IRON.
Falls Hollow Staybolt Co...Cuyahoga Falls, O.

HYDRAULIC DREDGES.
Great Lakes Engineering Works.....Detroit.

HYDRAULIC TOOLS.
Watson-Stillman Co., The.....New York.

ICE MACHINERY.
Great Lakes Engineering Works.....Detroit.
Roelker, H. B.....New York.

INJECTORS.
American Injector Co.....Detroit.
Jenkins Bros. .....New York.
Lunkenheimer Co.....Cincinnati.
Penberthy Injector Co.....Detroit, Mich.

INSURANCE, MARINE.
Elphicke, C. W. & Co.....Chicago.
Fleming & Co., E. J.....Chicago.
Gilchrist & Co., C. P.....Cleveland.
Hawgood & Co., W. A.....Cleveland.
Helm & Co., D. T.....Duluth.
Hutchinson & Co.....Cleveland.
McCarthy, T. R.....Montreal.
McCurdy, Geo. L.....Chicago.
Mitchell & Co.....Cleveland.
Parker Bros. Co., Ltd.....Detroit.
Peck, Chas. E. & W. F..New York & Chicago.
Prindiville & Co.....Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.

IRON CASTINGS.
Sutton Co., C. E.....Toledo, O.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland, O.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.
Truscott Boat Mfg. Co.....St. Joseph, Mich.

LIFE PRESERVERS, LIFE BOATS, BUOYS.
Armstrong, Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.

LIGHTS, SIDE AND SIGNAL.
Russell & Watson .....Buffalo.

LOGS.
Nicholson Ship Log Co.....Cleveland.
Walker & Sons, Thomas....Birmingham, Eng.
Also Ship Chandlers.

LUBRICATING GRAPHITE.
Dixon Crucible Co., Joseph..Jersey City, N. J.

LUBRICATORS.
Lunkenheimer Co. .....Cincinnati

LUMBER.
Martin-Barriss Co.....Cleveland.

MACHINISTS.
Chase Machine Co.....Cleveland.
Hickler Bros.....Sault Ste. Marie, Mich.
Lockwood Mfg. Co.....East Boston, Mass.

MACHINE TOOLS (WOOD WORKING).
Atlantic Works, Inc.....Philadelphia.

MARINE RAILWAYS.
Hickler Bros.....Sault Ste. Marie, Mich.

MARINE RAILWAYS, BUILDERS OF.
Crandall & Son, H. I.....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.

MECHANICAL DRAFT FOR BOILERS.
American Ship Building Co.....Cleveland.
Detroit Ship Building Co.....Detroit.
Great Lakes Engineering Works.....Detroit.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
The National Metallic Packing Co....Oberlin, O

MOTORS, GENERATORS—ELECTRIC
General Electric Co.....Schenectady, N. Y.

NAUTICAL INSTRUMENTS.
Benjamin Farnum How.....Boston
Ritchie, E. S., & Sons.....Brookline, Mass.

NAVAL ARCHITECTS.
Hynd, Alexander .....Cleveland.
Kidd, Joseph .....Duluth, Minn.
Mosher, Chas. D.....New York.
Nacey, James .....Cleveland.
Wood, W. J. .....Chicago.

OAKUM.
Stratford, Oakum Co.....Jersey City, N. J.

OIL ENGINES.
Mietz, Aug. .....New York.

OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph..Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Jenkins Bros. .....New York.
Katzenstein, L. & Co.....New York.
The National Metallic Packing Co....Oberlin, O.
Republic Belting & Supply Co.....Cleveland, O.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co. .....Cleveland.

PATTERN SHOP MACHINERY.
Atlantic Works, Inc.....Philadelphia.

Generated on 2024-08-30 17:56 GMT / https://hdl.handle.net/2027/mdp.39015043584393
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN